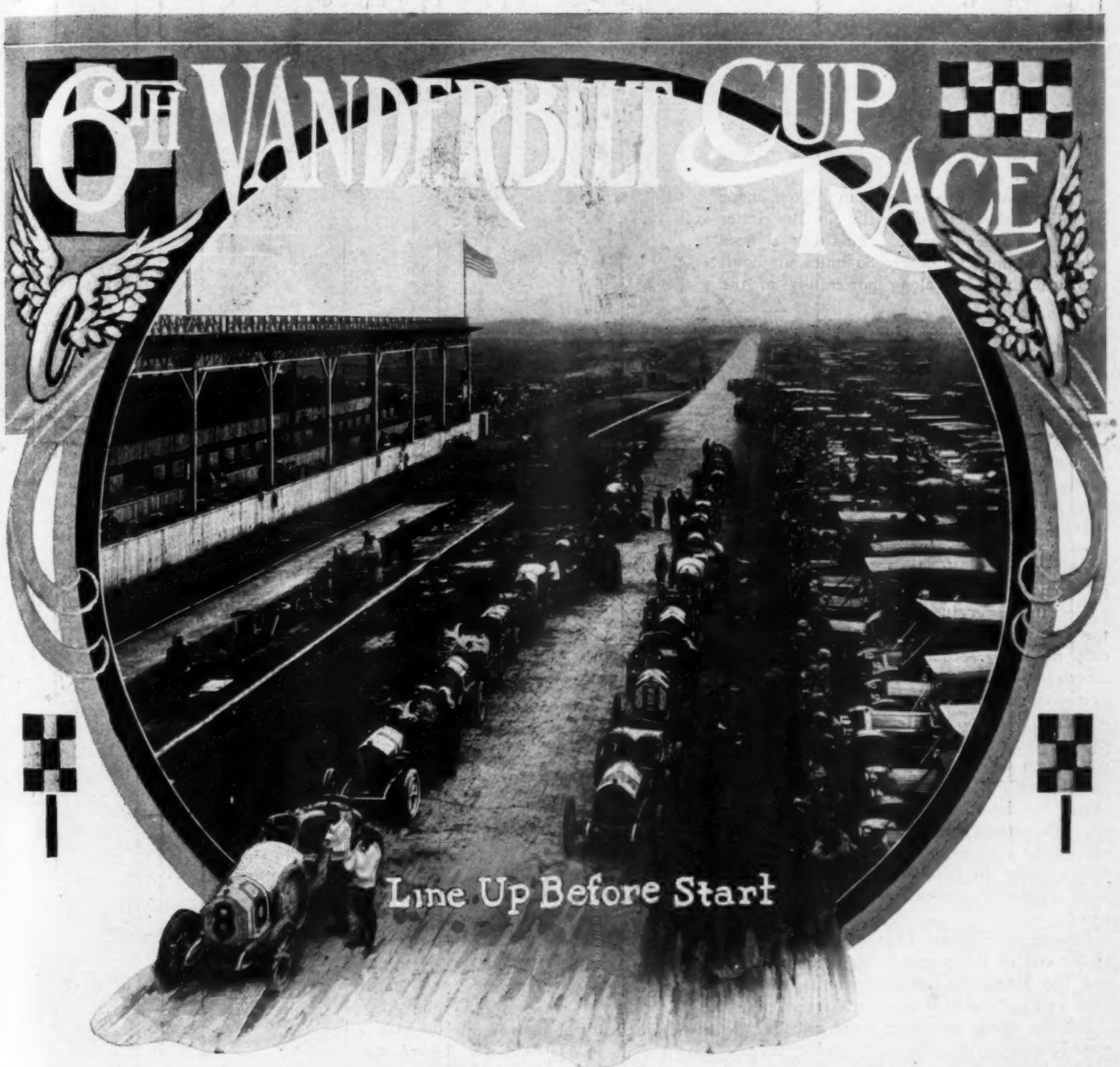
Vol. XXIII New York—Thursday, October 6, 1910—Chicago No. 14

The Automobile



In a race that broke four records, the Alco entry, Number 18, won the sixth running of the Vanderbilt Cup, Saturday. It was the fastest, closest, largest in point of entries and by far the hardest that has been run for the cup. The Marmon car, Number 25, was second, so close to the winner that the result was not definitely known until the officials had made some careful calculations to determine that the Alco had a margin of about 24 seconds. National, Number 10, was third, 1 minute and 6 seconds behind. Eight cars finished the contest according to the official figures and two others came up to the tape in time to have their status definitely fixed before the race was called off. These in the order of their finish were as follows: National, 31; Lozier, 2; Pope-Hartford, 17; Simplex, 11; Benz, 7; Stoddard-Dayton, 15; Pope-Hartford, 22, and National, 1. Ten of which were stock cars.

Harry F. Grant, driver of the winner, averaged 11:20 for each round, without reference to tire trouble, of which he had little. Once he stopped nearly four minutes while a tire was being replaced; another time such a change required nearly two minutes, and in the twentieth round he was held about as long a

time when his lead was less than two minutes, but was able to get going before the wasp-colored Marmon had quite time enough to push its yellow and black body to the front.

The race of the Alco was not spectacular in any respect. The car was always prominent and went to the front at the right time, managing to last long enough to win.

Not many of the quarter-million spectators selected the long-hooded, black six-cylinder car to repeat its victory of last year, and not until the race was half over did the running of the car impress itself on the general public. Then, when the rushing, driving rivals who had been in front succumbed for one cause or another, the Alco came into its own and landed the victory in one of the fiercest finishes ever witnessed here or elsewhere in such a long race, the margin being less than a half-minute.

The Marmon, while beaten, was not disgraced. It did not have the giant power of its conqueror by 22 horsepower and yet it was only beaten half a mile in nearly 300. Its driver, Joe Dawson, made a brilliant race of it all the way and looked all over a winner at one stage.

The National, driven by John Aitken, made a gallant showing, especially in the latter portion of the struggle. This car showed one round in 9.31, nearly 80 miles an hour, and was swinging along powerfully at the end.

Just at 6 o'clock the record-breaking field was sent away, with Livingston's National in front and Belcher's Knox as rear guard. One of the Oldsmobiles, Number 5, broke its oil pump on the way to the line and was withdrawn. All the cars got away in good order except Number 29, Marquette-Buick, driven by Louis Chevrolet, which stalled its motor just after the getaway. It required only about 10 seconds for Charles Miller, mechanician of the car, to re-crank the giant and Chevrolet drove that round at a pace never before equaled for a first lap on this course. His time was taken from the second his car started and includes the time spent in starting the engine for the second time. The car is credited with making the circuit in 10:46, standing start. Last year in the race he made a round under 10 minutes, but it was with a start where he moved over the line at full speed.

Despite his mishap, Chevrolet led his field at the end of the round by 14 seconds, the Knox being second and the Marquette-Buick, driven by Arthur Chevrolet, third, neck and neck with Burman's Marquette-Buick.

Tearing along for seven more circuits, the slowest of which was done in 10:33, Marquette-Buick, Number 29 held its lead until midway of the ninth lap. Repair work of nine minutes deprived him of the lead before the finish of this round and Burman's car assumed the pacemaking. That car had been following the lightning pace of Number 29 ever since the start, with the Knox second for three laps, when valve troubles put it out of the running. Dawson's Marmon had taken up third place when the Knox retired and moved into the runner-up's position and Marquette-Buick, Number 29, fell out for repairs.

Burman's car stood the pace for just one round, when radiator troubles intervened and the car was taken from the race.

This resulted in the Marmon's assuming the lead in the tenth round and holding it for eight circuits of the course. In the ninth lap the ultimate winner first showed prominently, when it finished in third position, 3:40 behind the Marmon. Disbrow's National, Number 31, displaced the Alco for a time and Louis Chevrolet's car, having completed its repairs, was rushed up to third place and eventually traded places with the National contender. But in the fourteenth lap the Marquette Buick was delayed 17 minutes in making repairs and in the next round met with a fearful end when its steering gear went awry on the back stretch. It was in the same round that the National, Number 31, hard-pressed by the Alco, moved into the placed positions behind the flying Marmon. One round at that pace was enough for Disbrow's car and the Alco dropped in behind the pace, about three minutes to the bad. John Aitken's National, Number 10, rushed into third position in the fifteenth round and made a bid for second in the two succeeding laps.

In the eighteenth the Marmon had a bad time, losing nearly nine minutes in repair work, resulting from an accident. This

A—Winning Alco at Westbury; B—Marmon car which finished second; D—The Lozier passing the grand stand; F—Apperson being flagged; H—No. 15 Stoddard-Dayton which finished; I—National No. 1 at Westbury turn

moved the Alco into the lead, with the National, Number 10, second, just ahead of the Marmon, which was four minutes behind the pace. From there to the finish the Marmon steadily decreased the distance between it and Grant's car, and when the latter stopped for a quick tire change in the twentieth lap the yellow jacket nearly reached him. But the black car had something left and in the fiercest drive ever witnessed in a Vanderbilt Cup race managed to last long enough to win by a margin of a trifle less than 25 seconds. The Marmon, going over 68 miles an hour for the lap, was second, and the National, pulling up a little when it was apparent that it could not displace either, was third.

C—No. 10 National at Westbury; E—National No. 31 passing the stands; G—No. 7 Benz, driven by Hearne, passing Westbury; J—The bullet-nosed Pope-Hartford No. 22; K—Amplex No. 9 on the course near the Hicksville turn.

The winner set a new mark for speed in this race, turning the 278.08 mile course in 4:15:58, or at a rate in excess of 65.18 miles per hour. Throughout the whole race Grant drove as if his car was the only one in the contest. He attempted no wild spurting. He simply reeled off the entire course at the rate of 67 miles an hour and tried to make up little of the time lost in making tire changes. It was a wonderful exhibition of nerve, but it lacked the vim and dash of some of his rivals. Aitken, driver of National 10, tried for the lead in the thirteenth lap, when he opened wide his throttle, declined to shut down on the turns and made the circuit in 9:31, the fastest time ever made in the contest, being nearly 80 miles an hour. Tire trouble in the earlier stages had dropped him a little too far to the rear and this one wild round landed him up with the leaders.

Early Friday evening the annual procession of automobiles started for the course from New York. As the hours wore on, the single line of cars became a double file and later a squad of four abreast on the main thoroughfare. By hundreds and thousands the cars came, choking the roads and carrying such an army as never before witnessed the big race. The number of cars at the course was estimated as high as 20,000 and the crowd that saw the race was measured up to the half-million mark. It is likely that 15,000 for the cars and 250,000 for the crowd would be conservative figures. Everybody was good-natured during the long watches of the night, but there was little apparent enthusiasm after the big race started.

The course was very rough in some spots, and the majority of the mishaps to the cars were caused by the tremendous jolting given them on the back stretch.

One danger that seemed possible and worried everybody before the race commenced did not develop. That was the likelihood of collision when two or more cars tried to pass on the narrow roads. The rule was made that the slower would have to keep to the right when a passage was attempted, and it worked very well.

In a word, from the viewpoint of automobile racing, the Vanderbilt Cup of 1910 stands out as the greatest of the series. It was gallantly run and won.

The miraculous skill of the drivers engaged in this race can be best chronicled by saying that in one of the laps thirty-seven cars were on the course at the same time. How they avoided a general mix-up speaks volumes for their skill and discipline.

The Wheatley Hills Sweepstakes developed a new claimant to speed honors when Falcars finished first and second in the 15-lap race on the Vanderbilt Cup course, which started an hour after the big cars were sent away. There were nine cars carded to go, but the Technical Committee disqualified the Correja entry because it did not conform with the stock car qualifications required under the terms of the contest. The Marmon got away in front and stayed there until the end of the seventh lap, when Gelnaw's Fal took up the running and won handily by over ten minutes from its teammate, which was driven by W. H. Pearce.

The Massapequa Sweepstakes, for still smaller cars than the Wheatley Hills, was won by a Cole "30," driven by Bill Endicott. An Abbott-Detroit, driven by Mortimare Roberts was second, and another Cole "30," handled by Harry Edmunds, was third. It was the luckiest sort of a win, for the Lancia entry, with a long lead, came to grief, turning turtle and going out completely. This left Endicott's car with a big margin of lead which he carefully maintained.

ONE OF THE
TO VIEW
THE NIGHT BEFORE THE BATTLE
HE MADE A FAIR SHOWING
SOME REMARKABLY CLEVER POLICEMEN
MA—MA
MA—MA
MA
MA—MA
MA—MA
THE MISSING BUICK GOAT—MASCOT

MANY VANTAGE GROUNDS
V THE RACE
WILLIE K AND GEN. MGR. PARDINGTON
IN FINAL TALK BEFORE THE RACE
A SNAP SHOT OF A
SPECTATOR
PARKING SPACE
$60 $60
AND THEY ENJOYED
THE RACE

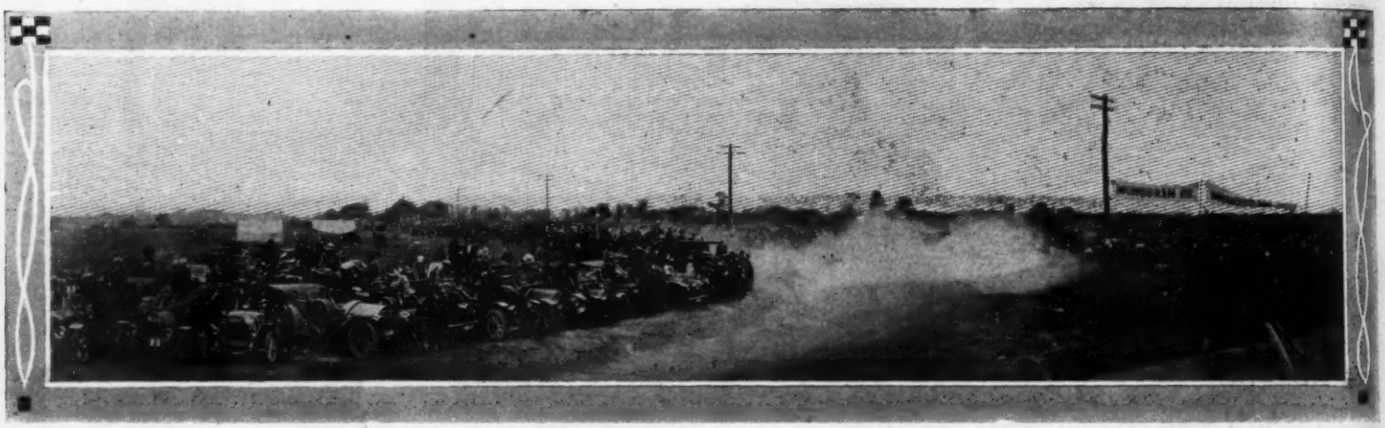
The Falcar finishing first in the Wheatley Hills Sweepstakes

At the Massapequa Turn

THREE disabled racing cars, all red, marked a special curve, some 30 feet beyond the crest of the earth and gravel banking which had been provided at the Massapequa turn. The first marker, car No. 56, arrived at about 8:30, the second, No. 54, at 9 sharp, and the third, No. 6, at 9:40. At the beginning of the turn the banking consisted mostly of a reddish-brown earth, affording an effectual retarder for the front wheels which bored themselves into it, giving the momentum of the car a chance to raise the rear wheels so they would slew around more easily. And slew they did, with few exceptions, from the beginning of the race until about 8 o'clock, when most of the soft-earth banking had been distributed over the clothes of the spectators.

Further on in the turn the banking, being here largely composed of coarse gravel, was more resistant and its outer edge was raised into the air like the crest of a choppy wave, separated by an irregular trough from a cornfield in front of a farm where most of the pedestrian spectators had placed themselves in a fringe that wavered in and out as caution or curiosity dictated.

As the soft part of the banking was wearing down, the crest of the gravelly part seemed to move into the course by comparison, but the majority of the drivers had learned to know the spot and carefully hugged the middle of the road. Still the crest became more and more indistinct, and every now and then one or another of the flying monsters, less coolly controlled than it should have been, squeezed an inch or two off this treacherous ridge, narrowing the road by that much for the next man, and each time this happened the driver could be seen rightening his car with two sudden movements of his steering gear. Yet nothing serious happened for over two hours after the start of the race. If only one half of the actual number of cars had been in the race the banking might have endured the test to the finish, almost as well as if it had been backed up with twenty more wagonloads of material on the offside. It was getting monotonous. Reports of real accidents from other parts of the course were floating from man to man, and from automobile to automobile in the parking spaces, and here at the worst turn nothing happened. Perhaps it was just because it was so bad and all knew it. The speed of the cars was certainly quite moderate. Nothing like 60 miles an hour. Nothing to compare with the bold turns at Krug's Corner and Jericho in the early days when Lancia and Nazarro taught the young native idea how to shoot and the Vanderbilt Cup race was an institution for the promotion of foreign purchases and domestic improvements.



At the Massapequa turn, throwing up dust and stones out of the loosely-placed banking material

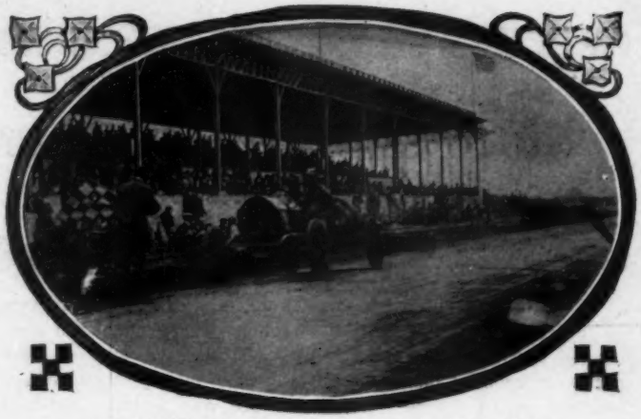
Abbott-Detroit car, No. 53, taking the Westbury turn

It seemed a good time for a belated breakfast. Probably all pessimistic views with regard to that banking were only the promptings of an empty stomach and lack of sleep. Rustic constables helped out the bracing morning air with surreptitious nips from flat bottles, ducking below the level of the crowd and leering in half-conscious betrayal of the impressive but misfit operatic policeman's uniform loaned them for the ocasion. Surely it was time for refreshment. In company with a sufficiency of roast lamb sandwiches and a bottle of mild Medoc the reporter sought a hospitable retreat. The repose behind a friendly stack of unhusked corn some 300 feet from the scene of action and apparently the only untaxed spot in the vicinity was slightly broken into by some faint signs of commotion. The parkers

WHAT A MEMBER OF "THE AUTOMOBILE" STAFF SAW AND HEARD AT THE FAMOUS CORNER WHERE DIRE THINGS THREATENED

stood up in their vehicles. Young persons ran up toward the turn and soon returned chattering. No voice was raised. The decorum was perfect. Evidently some car had a little tire trouble. It was scarcely worth while to run up with a bottle in one hand and a sandwich in the other to examine the specific causes of something so trivial. It could wait. A car swished by. Another. The people turned their heads after them and turned around and looked in the opposite direction, toward the parkway, for the next one. Everything looked regular. And it was. The remarkably cool temper of the spectators made it so. The little incident which had passed so smoothly was indeed nothing but the disabling of car No. 56, driven by Padula. A leisurely post-prandial examination, ten minutes after the act, found the red car resting in the edge of the crowd, with short stumps of the right rear wheel spokes dug deeply into the soft ground. The whole felloe and the tire were gone. The wreck was guarded by two Abbott-Detroit men who were tired of answering questions and looked glum. A telegraph pole bore slight witness of an encounter, and the bystanders confirmed the inference that it had been hit by the right rear wheel of car No. 56, with the result mentioned. The pole was placed about 16 inches beyond the ridge of the gravelly banking, previously referred to, and the car had evidently straddled the ridge.

Precisely at 9 o'clock the Lancia car, No. 54, came sidling down the road. Before it reached the turn, which is really two blunt turns in quick succession, it could be observed running at angle of 10 to 15 degrees with its axis, like a dog trotting. Something was the matter with it, but by some strong effort it rounded the first part of the turn. Then it shot in a perfectly straight line slantwise over the banking and charged straight for the scattering crowd. A child or woman screamed, just once. The car swung around its left front wheel, clear around, pointing with its rear end forward. It looked as if it must have hit a number of persons. It had come to a sudden dead stop, and the driver, William Knipper, and his mechanic were carried to the roadside. Racing is a profession. The incidents and accidents of it are part of the business. A spectator whose name was given as Morris Levinson suffered a broken leg. Within a few minutes he was taken in the waiting ambulance to the Homestead Hospital. The crowd was thick around the scene. When it scattered, Knipper and his man were also gone. The car, draped on the roadside about 30 feet behind No. 56, showed a front axle twisted to a partial fracture at the left steering knuckle and a shaker bonnet that was also damaged.



Cole, No. 51, winning the Massapequa Sweepstakes

Forty minutes later, when the end was in sight and while the fans were swapping notes and picking the winner, the Simplex car, No. 6, Ralph E. Beardsley driving, hove in sight and without any warning or indication that anything was wrong shot over the bank, following in the tracks of No. 56, and, in fact, bumped into the wreck of this machine so hard as to sever its rear axle from its fastenings by shoving the frame forward over it. Beardsley unlimbered his tall form from the cramped seat. He was unhurt, the mechanician likewise. And the car for a moment seemed good enough to resume work and was pushed into position for starting afresh. But closer inspection revealed something wrong, and its journey was ended then and there.

(*Continued on page 602*)

Scene at the Massapequa turn, where crowds congregated in the hope of seeing something happen

One of the little Massapequans at Hicksville

Stock Cars Prove Supreme

ALCO IN FIRST PLACE CLOSELY FOLLOWED BY MARMON, TWO NATIONALS, LOZIER, POPE-HARTFORD, SIMPLEX, BENZ, STODDARD-DAYTON, ANOTHER POPE-HARTFORD, AND THE THIRD NATIONAL, PRESENTING A STOCK CAR EVENT WITH A SINGLE RACING MACHINE, THE BENZ, AMONG THE CARS THAT COMPLETED THE FULL DISTANCE

SIX years ago, when the first Vanderbilt Cup Race was run, every entrant was a special racing car, designed and constructed specifically for racing purposes, and the cost of these special automobiles ranged all the way from twenty to sixty-three thousand dollars apiece. When the race was declared finished, there were but four of these special cars in the running, and of the four cars but one was of American design and construction, i.e., the Simplex, and it was in a state of bad repair at the end of the race. A review of the several events leading up to the Sixth Annual Race, just completed, would amount to a substantial re-statement of the above, excepting that from year to year American automobiles took the more prominent part, and even last year the American builders were censured by those who thought they knew all about it, because they persisted in using their stock automobiles in preference to building racing cars.

To the sporting fraternity it looked as if an automobile, to be able to compete in a great event, would have to be specially designed and constructed, utilizing the freak ideas of some abnormal mind, paying but slight attention to the regular and orderly thoughts and considerations that govern the acts of designers who obey the conventions and bow to the will of precedent. The Sixth Annual Vanderbilt Cup Race, as it terminated on October 1, is a monument to the acumen of the builders of American automobiles, the obverse side of which is inscribed, telling of the stupidity of all who put their faith in special racing machines, and who relied upon the patronage of sports, rather than upon their own good sense to guide them to success.

Disregarding, for the time, the fact that the stock automobiles that competed in the last Vanderbilt Race may have been tuned up for the occasion, and otherwise prepared for the strenuous work expected of them, the fact remains that substantially every one of the good performers were stock cars, whereas the special automobiles, almost without exception, were found by the wayside, wrecked beyond recognition, in some cases, practically beyond repair in all instances, and so thoroughly in disrepute because of their poor performance in competition with stock automobiles that it is a question whether or not any maker of cars will ever again risk his reputation by putting a specially built racing machine in competition with a sturdy stock car.

The newspapers everywhere are taking advantage of the headline material that is so much in keeping with their tastes and their needs; they point out that the track was in wretched shape, with dangerously banked curves, and all the other surface indications of lack of preparation, and there is ample evidence to be seen at every hand of the fact that it was a gruelling test for the cars, conducted under the most severe conditions imaginable, and what does it show? The automobiles that were in at the finish were all stock cars, excepting one, and that was the only foreign automobile in the race that made a showing worth talking about, and it finished eighth. From the winning Alco No. 18 driven by Grant down, including Marmon No. 25 driven by Dawson, National No. 10 driven by Aitken, National No. 31, driven by Disbrow, Lozier No. 2 driven by Mulford, Pope-Hartford No. 17 driven by Fleming, Simplex No. 11 driven by Mitchell, Stoddard-Dayton No. 15 driven by Harding, Pope-Hartford No. 22 driven by Dingley, and National No. 1 driven by Livingstone, the entire list belong in the stock car category. These models may be had by any automobilist who may care to purchase them, and these cars are built in the regular way, by routine methods in the several plants, and they prove that the regular way is the only way to attain truly reliable results.

Pursuing this line of thought to finality, it is only necessary to say that the cars that were running, but that did not conclude the twenty-second lap when the race was called off, belonged to the stock category also. This list of cars, beginning with the Amplex No. 9 driven by Jones (the only 2-cycle automobile in the contest), included the Oldsmobile No. 20 driven by Stillman, Houpt-Rockwell No. 26 driven by Linberg, Apperson No. 28, driven by Hanshue, and Jackson No. 19 driven by Scheifier. The Knox No. 32, driven by Belcher, is a member of the stock car family also, and while it failed to stay in the race up to the finish, the fact remains that it completed its first lap in 11 minutes and was only prevented from giving its customary good account because of a valve disorder, whereas the specially built racing machines showed lack of stamina, and were spilled by the roadside, in some cases being so completely disrupted that it would take an automobile expert to tell that they were originally intended for racing machines.

The absence of the Old Guard of foreign racing automobiles this year is the best indication possible to have of the fact that the makers of these special types of racing machines are fully alive to their uncertainties, and the foreign builders are cute enough to know that it is better for them to "rest upon their laurels" and try to survive on a "has been" basis than to struggle with the inevitable. There is nothing unusual about this attitude on the part of these makers; they have experience, and they know that a regularly built automobile is the product of evolution, whereas a special machine is the progeny of a revolution.

The very fact that the foreign makers of automobiles are taking and using American machine tools of the kind that have been developed in connection with the building of automobiles is sufficient proof of the keenness of the foreign makers, and it is not too much to state that keenness is the child of experience.

The only class of people who seem to be a little dull about the real status of the racing machine versus the stock automobile is the American purchasing public. It seems to have been the understanding of this public that the quality of an automobile is gauged on the scale of dollars, particularly if the name-plate on the car bears the cross of the collectors of the Port of New York. It will come as a surprise to those who have overlooked the underlying merit of standard methods of construction to find that American stock cars not only are capable of winning in a race like the Vanderbilt, but they finish in good shape.

The facts cannot be enlarged upon; the record speaks for itself. It is useless to try to emphasize the situation as it is. Perhaps a few of the underlying reasons will serve to clear the atmosphere and settle once for all the proper status of stock cars. The reason why special racing machines were conspicuous performers in the earlier events is due to the fact that the evolution of the stock car from its inception to its present state of perfection took five years in the consummation. Special cars, although they must ever rank as mere model work, had the advantage of much attention on the part of men who were more or less skilled and experienced in work of this character, and they rendered many a good service to the automobile business because they tried out a great number of ideas, all of which, in so far as they possessed merit, were incorporated into the stock cars, forming a part of the very evolution that ultimately resulted in the supremacy of the stock car and the downfall of the specialized product.

All Eyes on Grand Prize

MOTORDOM TURNS FROM VANDERBILT CUP RACE TO THE BIG CONTEST FOR UNLIMITED MOTORS WHICH WILL BE HELD OCTOBER 15

ENTIRELY different in its conditions from any other road race in the United States this year is the Grand Prize contest for the $5,000 gold challenge cup of the Automobile Club of America, which will be held on the Vanderbilt Cup course October 15. The only limitations placed upon the contestants are as to width, which must not exceed 68.89 inches; exhaust, which must not be directed toward the ground and each car which must not be directed toward the ground, and each car cars must be examined by the Technical committee prior to practice and must secure certificates showing that they are safe. The cars are required to carry two persons seated side by side, weighing at least 134 pounds each on the average. No agent of oxidation other than atmospheric air is to be allowed.

Under such a system of rules, the contesting cars may be simon-pure racing machines with special motors and special refinements of construction and equipped with any sort of device to assist mechanical operation that is deemed to be advantageous. On the other hand, stock cars with racing equipment are not barred. There is no limit on the size of engine to be used. Automobiles with nine-inch cylinders are eligible, just as are those of half that diameter.

The original intention was to have the distance of the race 22 laps on the 12.64 miles course, but later it was decided to increase the length of the run to 30 laps, which makes the distance 379.2 miles.

The start will be at daybreak, just as it was in the Vanderbilt, but owing to the moderate sized field, the intervals at which the contestants will be sent away will be 30 seconds.

The entry list this year consists of four trios and three single entries. Under the rules, each car must represent a member of the International Association of Recognized Automobile Clubs and while three countries are represented, only two clubs have been certified.

The Kaiserlicher Automobile Club of Berlin is represented by three Benz cars, while the other dozen in the list are credited to the Automobile Club of America. This classification is broader than it really should be, as the Fiat trio, Italian cars of much class, are included among those which will carry the colors of the American club and the same may be said for the Mercedes, entered by George W. Loft.

The sure-enough American cars that are carded to start are three Marmons, three Marquette-Buicks, an Alco and a special Roebling-Planche. Thus there are four German cars; three Italian and eight Americans in the race.

The drivers engaged to participate in the race represent the highest types of automobile pilots developd both here and in Europe. The contest will hardly prove to be as much of a drivers' race as the Vanderbilt Cup. The result will not be so strictly chargeable to good or bad driving as was the great contest of October 1.

The reason for this is two-fold: First, the field is only one-third the size of the Vanderbilt and second, there are no weak spots in the entire list of drivers. In other words, no matter how the race results, the outcome probably would not be changed if the driver of any of the losing cars had been seated behind the wheel of the automobile that finishes first.

Every man can be relied upon to get the uttermost atom of speed from his charge, as all are past-masters of the driving art.

From the viewpoint of actual money prizes, the Grand Prize is the richest in America. The Motor Cups Holding Company has hung up $7,000 for the winner and placed cars and while only $1,000 in supplementary and accessory prizes has been offered so far, before the day of the race dawns, the list will undoubtedly be largely augmented, and may reach $10,000.

The race October 15 is the second that has been held for the magnificent trophy and purses. The former run-off was held at Savannah, Ga., Thanksgiving Day, 1908, and the money prizes for that event approximated $20,000.

There were twenty starters, fourteen of which were the cream of European workmanship, guided by the best talent available. There were six American cars in the contest, but they were outclassed by the foreigners. The race was won by a Fiat, driven by Louis Wagner, who will also conduct another Fiat in the coming race. His win was spectacular and sensational in the extreme and was largely due to an element of racing luck in the final round.

The winning Fiat, a Benz driven by Hemery and another Fiat, driven by Nazzaro, had been running neck-and-neck since passing the middle ground of the course. For the last eight laps these cars alternated in the lead, and upon entering the final round Nazzaro's Fiat had established what seemed a winning margin over the Benz racer. Wagner's Fiat was in third place, about two minutes behind the leader.

While in full flight after passing the stand, Nazzaro suffered a puncture and time spent in repairs wiped out his lead. Then another puncture intervened and his chances for first place went winning. Wagner, without suffering any mishaps, swung over the line 56 seconds ahead of the Benz, while the unfortunate Nazzaro was third.

In the coming race this trio will have mounts from the same makers as they drove in the former race and a terrific struggle between them is promised, no matter where they finish. The roughness of the course must of necessity place a limit on speed. It is unlikely that many measured miles will be run at a 100-mile an hour gait, not because the cars are not fully capable of such speed, but by reason of the minute ruts and ripples on the racing surface. In the Savannah race a Renault car went slightly faster than 101 miles an hour for a single mile and one of the other contestants made an even 100-mile rate for a short distance. The straightaways, however, on the Southern course were longer than any on the Vanderbilt raceway.

At an average speed of 70 miles an hour, which does not seem a wildly unlikely speed, the American cars have shown that they are capable of maintaining that pace. Many miles have been timed in practice close to the 70 mark and rounds of the course in about 10 minutes have been common enough both in practice and in the Vanderbilt Cup race. An average round of 10:50, carried throughout the thirty laps, would be at a rate of 70 miles an hour and such speed is promised in practically all the camps.

The entries for the race are as follows:

Car.	Entrant	Driver
Benz	Benz & Co.	Barney Oldfield
Benz	Benz & Co.	Victor Hemery
Benz	Benz & Co.	Franz Heim
Fiat	Fiat Auto Co.	Louis Wagner
Fiat	Fiat Auto Co.	Ralph De Palma
Fiat	Fiat Auto Co.	Felice Nazzaro
Marmon	Nordyke-Marmon Co.	Ray Harroun
Marmon	Nordyke-Marmon Co.	Joseph Dawson
Marmon	Nordyke-Marmon Co.	.....
Marquette-Buick	Marquette Motor Co.	Louis Chevrolet
Marquette-Buick	Marquette Motor Co.	Robert Burman
Marquette-Buick	Marquette Motor Co.	Arthur Chevrolet
Roebling-Planche	W. A. Roebling, 2d	W. A. Roebling, 2d
Alco	Am. Locomotive Co.	Harry F. Grant
Mercedes	George W. Loft	George H. Armstrong

The dark horse of the race is the Roebling-Planche entry which will be driven by Washington Roebling 2d. All the others are familiar racers. Mr. Roebling is an experienced driver and the word has been passed around that he expects to give a good account of himself in the contest.

French Commercial Test

MASTER BUILDERS OF PARIS TRY OUT VARIOUS TRUCKS WITH THE VIEW OF DETERMINING ECONOMY AS COMPARED WITH HORSES

INTERESTING official figures on the cost of automobile transportation for the building trade have been secured as the result of a month's test held jointly by the Automobile Club of France and the master builders of Paris and district. Believing that economies could be effected by using motors in place of horses, but not having the necessary technical knowledge to work out a scheme of motor transportation, the Master Builders' Association appealed to the technical committee of the French Automobile Club. This latter body arranged with eight automobile constructors to supply one truck each, and to submit to a rigorous control in order that accurate figures on cost might be furnished the builders.

The work to be undertaken consisted in transporting stones, gravel, plaster and general building material from the Association's quarries and headquarters at Viry-Chatillon to the site of building operations at Villejuif. The journey was one of 10.2 miles, over moderately good roads; the estimated speed was 6.2 miles for the outward trip under load and 8½ miles for the return journey empty. The load to be carried varied from 3¾ to 5¼ tons, but the method of payment was made according to square meter of material (stones, gravel, sand, etc.) and not according to weight, a single journey with a full load being paid at the rate of $3 to $4. Theoretically a square meter of any given material from one quarry ought to be practically invariable in weight, but it was found that the density of the material to be transported showed such differences that weighing had to be resorted to.

The tests showed that the precentage of time during which the vehicles were held up for repairs was 13 per cent. of the actual working time. Although it is obviously desirable to reduce this figure as low as possible, the technical committee considered it satisfactory, for the Paris General Omnibus Company estimates 20 per cent. of the running time for repairs and renewals. Working 9½ hours a day, traveling 62 miles, and maintaining an average speed of 6½ miles an hour, the average consumption of the eight vehicles was 13.2 gallons of gasoline, 1.1 gallons of lubricating oil, and ¼ pound of grease per day, the cost being, in round figures, $4 per day for fuel. In making comparisons it must be remembered that gasoline costs practically 42 cents a gallon outside Paris. As a basis for this class of work it was established that for 5-ton loads a motor of 25 to 30 horsepower should be employed; cost of fuel should be calculated at $4 to $5 a day; repairs and renewals should be calculated at the rate of $5 to $6 a day, the fuel consumption should not exceed 14 gallons, and the range of action should be about 60 miles a day. These figures are based on trucks with metal-shod wheels; if solid rubber tires are employed the cost is estimated to be increased by 3 cents a ton-kilometer. It should be noted, too, that for this class of work every full journey was followed by one of equal length without load, and that the distance being comparatively short, much time was spent in loading and unloading. Had it been possible to give the trucks a load for the return journey a considerable economy could have been effected.

The trucks submitted varied considerably, as will be seen from the following table setting forth their characteristics. They had all internal-combustion motors, and all chain drive, with the exception of the Krieger, which had electric transmission and drive. Metal tires were employed by all but the Dietrich and Krieger. Three of the competitors used tip bodies, the other five having the fixed type. The width of the bodies averaged 40 inches, but the length varied from 13 feet to 23 feet; the weight of the body alone averaged 1,110 pounds. Delahaye, Krieger and S. T. I. M. used gasoline as fuel; Dietrich employed white spirit; Soller and Aries employed benzol, and Schneider and Dufour used successively gasoline, alcohol and benzol.

Make	H.P.	Bore Ins.	Stroke Ins.	No. Cyl.	Cooling	Quantity Water	Weight Empty, lbs.
Dietrich	27	4	6.2	4	Pump	8.8	7,275
S.T.I.M.	25	4.3	5.5	4	Pump	17.6	10,000
Soller	24	8.2	6.2	2	Pump	22	9,259
Aries	30	5.1	5.1	4	Pump	6.6	.....
Schneider	40	4.8	5.5	4	Thermo	7.2	11,000
Krieger	24	3.5	4.7	4	Thermo	8.8	5,467
Dufour	20	7	6.2	2	Pump	15.4	7,495
Delahaye	30	3.9	7	4	Pump	9.9	7,275

Ignoring the amounts spent on the vehicles for repairs, the most satisfactory performances were made by the Delahaye, Schneider, Soller and Aries trucks. The following table shows the distance covered both under load and empty, the time spent in useful work, the consumption of gasoline and lubricating oil and the average speed maintained. Under this latter head is given the average under load and empty, the difference between the two being very slight.

Truck	Distance covered Total	Load	Empty	Time, hrs.	Speed av'r'ge	Av. Daily Consumption Oil	G's'l'ne	Average useful load, lbs.
Dietrich	1,481	739	742	186.3	7.5	2.1	14	8,099
S.T.I.M.	1,114	556	558	216	6.4	1.7	12.3	8,886
Soller	1,525	761	764	270.2	6.9	0.75	14.7	11,772
Aries	991	495	496	185	6.5	0.95	14.0	11,772
Schneider	703	351	352	119.2	7.3	0.81	13.1	11,862
Krieger	844	424	420	145	6.9	0.67	11.2	8,677
Dufour	...	...	...	...	...	...	...	.....
Delahaye	1,481	739	742	255	7.2	0.38	10.8	9,347

Distance and speed limits in miles; oil and gasoline in gallons

Car versus Horse in Real Economy Test

In an effort to prove the much-discussed proposition that it is cheaper to drive and use an automobile than a horse and buggy, the Maxwell-Briscoe Motor Company is conducting a practical test in New York City and vicinity. This test consists of actually driving a horse drawing a buggy for six hours a day and a Maxwell automobile of current type, four-cylinder motor, for the same length of time.

Of course the automobile goes practically over twice as far as the horse in the course of the six hours run each day and the figures, in order to form the basis of any just comparison, must take that fact into consideration. The comparative cost per mile and cost per passenger per mile to operate both systems of transportation have been worked out in detail as far as the test has progressed.

All the suburban districts of New York as well as the heavy traffic streets of the metropolis have been or will be covered.

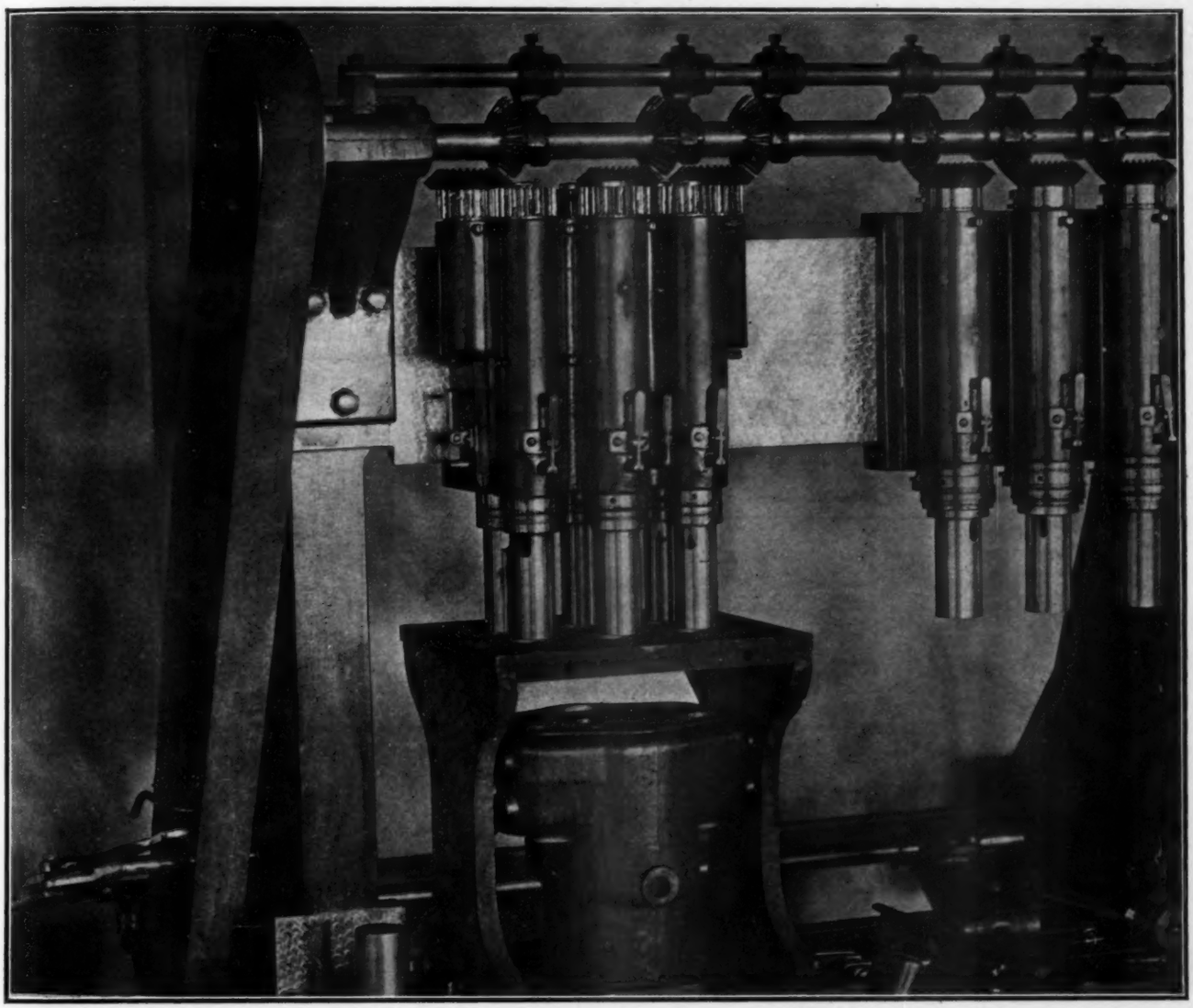
One day's run is typical of the rest as far as the figures are concerned. Take the fourth day for example. The route was laid out through Staten Island and the interesting contest started at 9 o'clock in the morning. The horse and buggy were first away, but the car soon established a big lead and was only in sight of the horse when doubling on its trail.

During the six hours the car covered 80 miles without any mechanical repairs, replacements or adjustments. The motor consumed 5 3-4 gallons of gasoline, which cost at retail 16 cents a gallon or 92 cents. It also used one pint of lubricating oil at 65 cents a gallon or 8 cents. This made the total $1 even for the day.

The horse traveled 35.8 miles during the six hours and required 12 quarts of oats at 6 1-4 cents per quart or 75 cents and 20 pounds of hay at 1 cent per pound or 20 cents. This made the total expenditure for the horse 95 cents for the day. But the horse traveled only 35.8 miles on 95 cents, while the car made 80 miles on $1.

Among the Makers

DETAILS OF THE RAMBLER FOR 1911—PULLMAN LINE FOR THE COMING YEAR WILL SHOW MANY REFINEMENTS—MECHANICAL POINTS OF THE SELDEN—ELMORE 1911 MODELS DISCUSSED



SPECIAL FORM OF MULTIPLE-SPINDLE DRILL USED AT THE MOON PLANT TO BORE CYLINDERS WITHOUT RESETTING

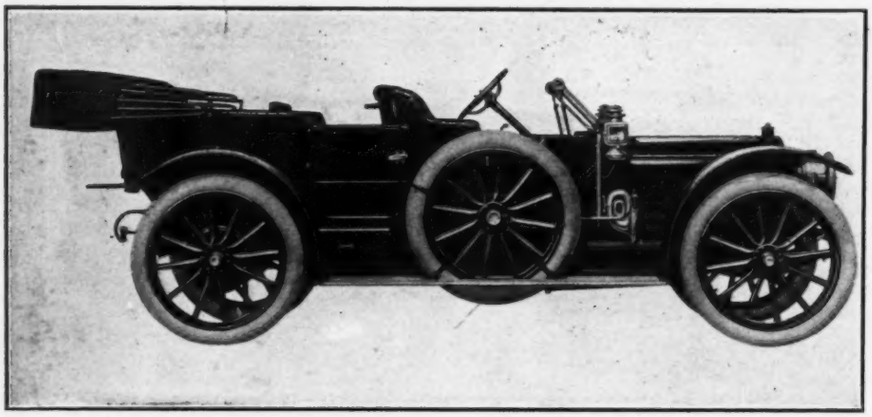
SPECTACULAR automobile building is passing into history and the time is arriving when the man who elects to go into the business of manufacturing automobiles will have to make a large investment for special machine tools of the class that will be capable of doing work on a par with the special forms of machinery that are now being employed in the plants where automobiles are really made. A cursory examination of the manufacturing proposition, considering it as a whole, lends substance to the conclusion that automobiles will have to be sold hereafter, and the man who buys is much inclined to find out what he is to get for his money. In the plants that are fitted out to build good automobiles in sufficient quantity to control the "overhead" charges, despite an enormous investment in special machine tools, there will be no difficulty in convincing the man who buys that he will be justified in making the investment, but the influence of special equipment will be felt by makers in one of two ways, *i.e.*, (a) the maker who is so fortunate as to have the special equipment will be able to turn out a large number of good automobiles at a low price, (b) the maker who cannot afford to manufacture on a specialized basis will have to devise some way to back out of a critical situation. Prospects in the commercial automobile field are regarded as sufficiently good by some makers of passenger automobiles as to serve as the reserve position if a turning movement becomes necessary. This is all very consoling, but if all the makers of passenger automobiles turn their attention to the manufacture of freight automobiles, provided they move simultaneously, the supply of freight automobiles will far exceed the demand.

Rambler Line for 1911

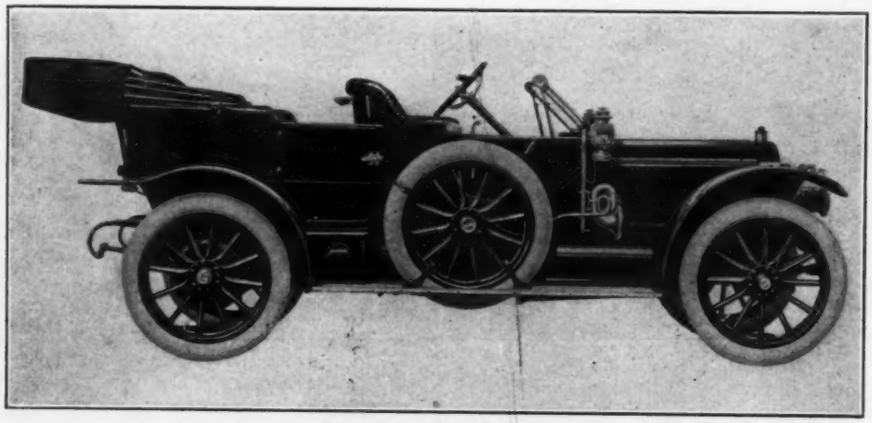
TWO CHASSIS AND NINE SEPARATE STYLES ARE OFFERED FOR THE COMING YEAR—DETACHABLE FORE-DOORS AND NUMEROUS REFINEMENTS WILL FEATURE THE OUTPUT

THE Rambler for 1911 offers a complete line, including open and closed cars in nine different styles, all with detachable fore doors. The details and mechanical construction of all are alike and there are two sizes—45 and 34 horsepower. The fundamental Rambler advantages characteristic of previous models, the offset crankshaft, straight-line drive, large wheels and tires, spare wheel and engine accessibility, are all continued.

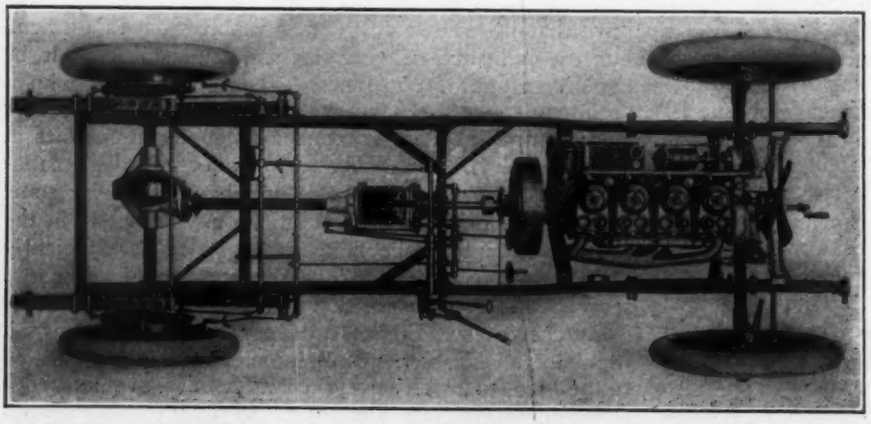
Improvement has been made chiefly in details which have been thoroughly refined. Standard equipment for all 1911 models include spare wheel and tire, Hartford-Truffault shock absorbers, top and envelope, wind shield, gas headlights and Prest-O-Lite tank, combination electric and oil side and tail lamps.



Model 55 complete with top, top cover, glass front and spare wheel



Model 63 presenting the right side of the car with the spare wheel on the running board



Model 64 chassis, showing brake adjustment by means of thumb nuts and larger brakes

The 45-horsepower chassis is used for Ramblers Sixty-four and Sixty-five. Sixty-four may be had as a five-passenger touring car, toy tonneau or landaulet; Sixty-five as a seven-passenger touring car or seven-passenger limousine.

Sixty-five has 128-inch wheelbase, 40 inch wheels and 4 1-2 inch tires, underslung front springs and drop frame. The two features last mentioned are to provide a low body level and this model, with 40-inch wheels and the increased clearance, has the same body level as the five-passenger model with 36-inch wheels. It is particularly pointed out that with the advantages of clearance, riding qualities, appearance and less tire wear provided by the larger wheels and tires, the increase in tire cost over the 36 x 4 1-2 size is but $10 per tire. The standard finish for Sixty-five includes nickel trimmings. This change from common practice with 40-inch wheels gives to this model added character and individuality.

Rambler Sixty-four, in other details like Sixty-five, has 120-inch wheelbase, 36-inch wheels, 4 1-2 inch tires and regular front spring suspension with straight frame and brass trimmings.

The 34-horsepower car, known as Sixty-three, is furnished as a five-passenger touring car, two-passenger roadster, four-passenger coupé and town car. This is a more economical car to use and maintain and is particularly popular with the owner who prefers to drive his own car.

The Roadster is regularly geared to a speed of from 55 to 60 miles. For a hilly locality a lower gear, giving greater hill climbing ability is optional.

Sixty-three has 112-inch wheelbase, 36-inch wheels and 4-inch tires. This model is furnished with dual ignition, Splitdorf magneto and 6-80 Vesta storage battery.

The 45-horsepower models have double ignition, Bosch magneto and 6-80 storage battery. Both sets, by means of the Rambler high-tension switch and the Rambler timer, operate through a single set of plugs.

Sixty-three body is trimmed with a good quality of machine-buffed leather and the larger models with hand-buffed quality. Excepting these two particulars, magneto and leather, the quality and details of all models are identical.

The improvements which are found in these 1911 models are as follows: The fore doors for all models are practically dash high, but are detachable. Anticipating a desire by owners to remove the doors in hot weather, new models have been designed so that they may be used and look equally well whether with or without the doors. To accomplish this interchangeable feature, the front floor and floor supporting brackets have been redesigned. The sloping section of the floor now has a greater angle with, of course, corresponding increase in comfort as a foot rest and the side brackets are flush with the floor level.

On earlier models these side brackets were higher. On the lever side a solid panel, a duplicate of the door on the left side, extends from the seat to the dash with transmission lever inside and brake lever in a convenient location outside. The latch for the left side door is secured to very neat aluminum door jamb fastened to the seat riser. The photographs illustrating the appearance with and without the doors.

The standard form of front springs, semi-elliptic, is continued, but these springs are now wider and thinner, providing greater flexibility. One of the most important changes is found at the rear springs. These are called 7-8 elliptic, differing from the common type of 3-4 elliptic spring in that the upper section is longer and is secured at two points instead of one. By passing two spring bars through the frame from one spring to the other and securing the springs to these bars, the frame is relieved of practically all twisting strain and side sway is effectually minimized. Grease cups are now equipped at every spring joint.

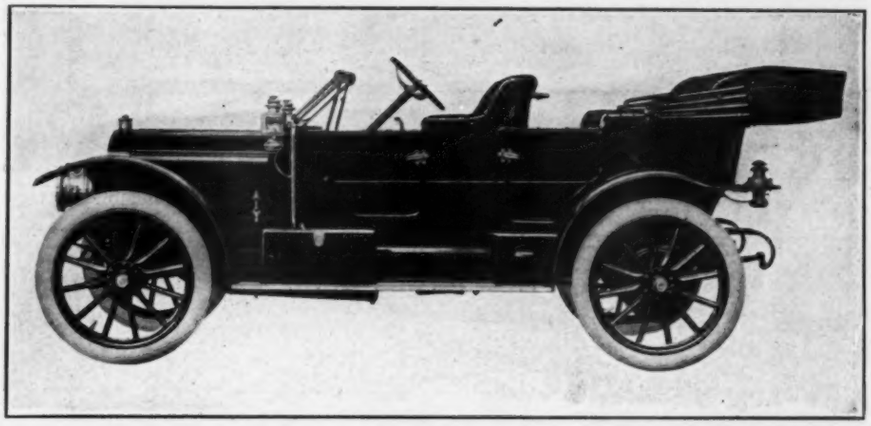
In conjunction with the new springs, Hartford-Truffault shock absorbers are included as standard equipment. Four are furnished for the 45-horsepower chassis and two for the 34-horsepower chassis.

The brakes are larger and the leverage greatly increased. The wheels may be locked by the application of either set and every car is required by test to come to a full stop from a speed of 18 miles an hour within 50 feet. The brake drums are increased in diameter from 13 to 15 inches. In width the braking surface is increased from 2 to 2 3-4 inches, the total increase in surface being 97 square inches. The foot brake is connected to the outer band, the band being contracted by lever action giving a greatly multiplied force over the previous design.

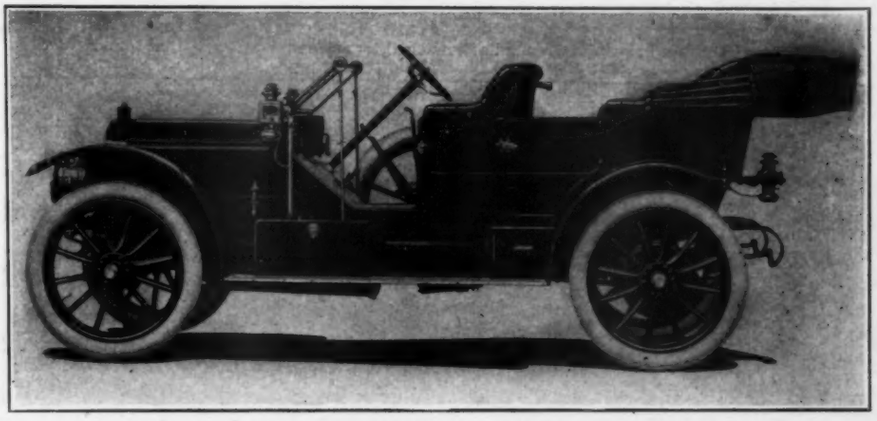
The inner expanding shoes are operated on the toggle joint principle. The application of both sets of brakes is shown by the illustrations. Both brakes are provided with equalizers. Spokes for 36-inch wheels are increased in width from 1 1-2 to 1 3-4 inches and are 2 inches wide for the 40-inch wheels.

The Stromberg carbureter has been adopted for 1911 and it is located on the right instead of on the left side. This change principally facilitates starting in cold weather. The inlet manifold is carried above the exhaust and two priming plugs are placed on the top in an accessible position. If at any time difficulty is experienced in starting, raw gasoline may be inserted by removing these priming plugs.

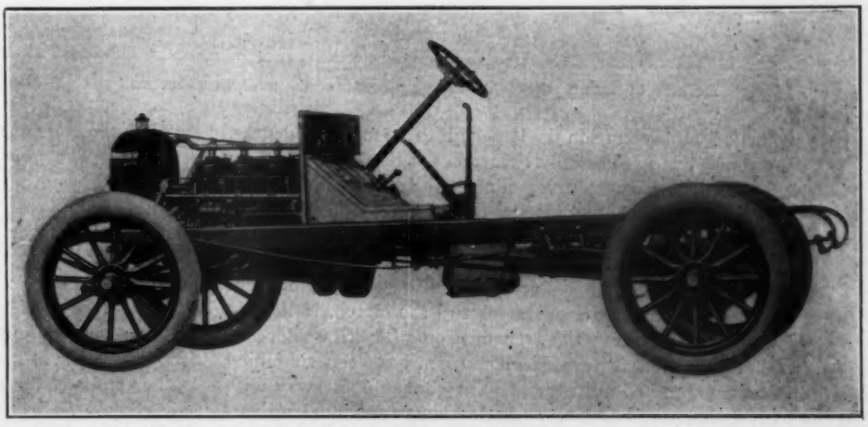
The cams and camshaft are now forged integral. The cams are alike and uniformity in this particular is absolutely assured in every motor. The magneto coupling is now bolted together. This facilitates removal of the magneto and change of timing. The lubricator, formerly supported in a bracket attached to the frame, is now secured to the engine. The oil feed pipes are



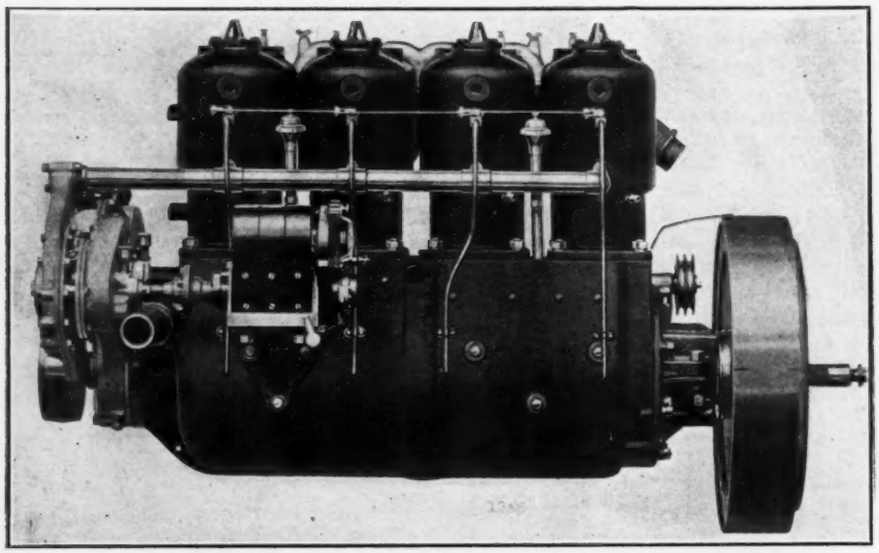
Rambler 63, including top, top cover, glass wind shield, spare wheel, tire, lamps and tools



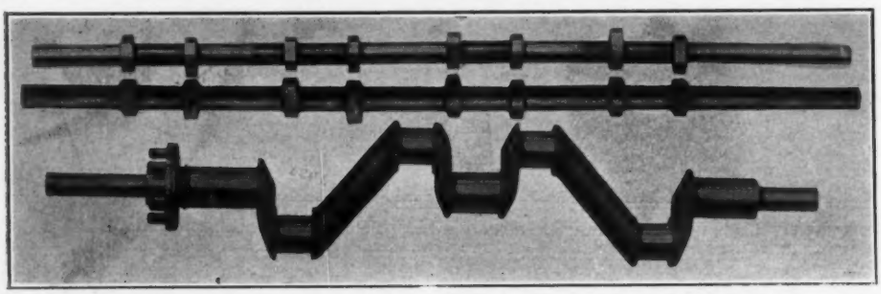
Model 63, showing car with fore-door detached for hot weather



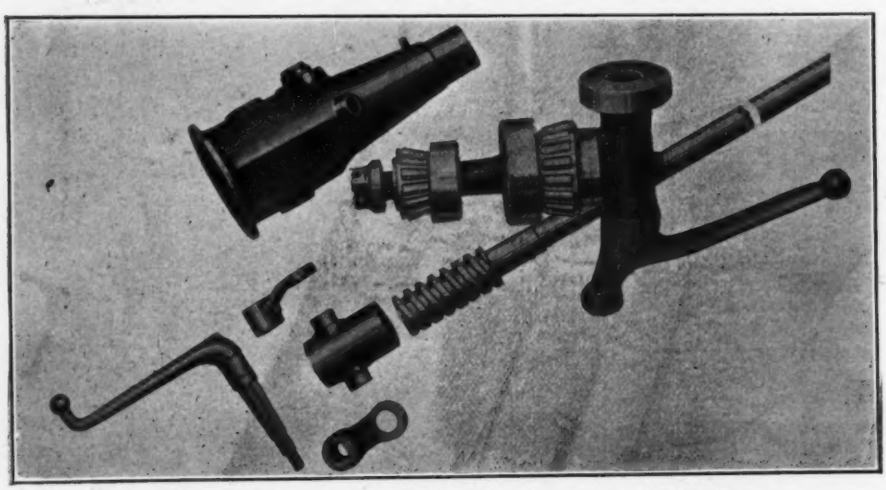
Model 64 chassis, side view, showing new aluminum floor design



Model 64 and 65 engine, showing new location of magneto, heavier pump and drain pipe



Model 64, crankshaft and camshaft, with integral cams properly hardened



Details of front wheel knuckle and parts as used in steering

thus shortened and vibration is lessened to a marked degree.

The ignition wiring is partially encased. On the 45-horsepower chassis the crankshaft and bearing surface is increased 28 square inches. The flywheel is bolted instead of beyed to the crankshaft. Although of the same weight as before, the metal in the flywheel is diffrently distributed to give greater weight at the rim.

The universal joint shaft is longer. The increase is sufficient to permit the removal of the universal and the clutch, if it is so desired, without disturbing the transmission. The Rambler expanding clutch, now a feature of all models, has been simplified both in construction and adjustment. The change does away with the separate shoes and separate toggles with individual adjustments provides a single expanding shoe, thus giving equal pressure at all points and contact throughout most of the entire circumference. One simple adjustment of the toggle joint makes all necessary changes.

The transmission gears are heavier, being 3-16 inch wider. A lock is placed on the second gear to hold it in engagement. Taper roller bearings are substituted for ball-bearings at the rear axle differential. This is also true of the wheel bearings on the front steering knuckles for the 45-horsepower chassis.

The radius or distance rods, previously used on all Ramblers, are replaced by a combined distance and torsion rod. At the axle end these rods are secured to a forged bracket above and below the axle, rigidly holding the axle in place and relieving the drive-shaft housing of torsional strain. At the other end these torsion rods are secured in ball and socket joints to brackets bolted to the frame side members. Heretofore the brackets for the forward end of the radius rods were bolted to a cross frame member. The change gives increased rigidity. The re-enforcement in the tubular front axle for the 45-horsepower models is treble its former thickness, giving proportionately greater strength.

The knuckle pin for the larger chassis is secured in the steering knuckle to prevent wear between knuckle and pin. Hardened and ground bearings are placed in the knuckle yoke and the pin is hardened and ground at the point of contact with these bearings. The wear is divided between these bushings and the ball thrust bearing on top of the knuckle.

The appearance of the car viewed from the front is quite materially changed. The radiator is supported on an aluminum girder of new and neat design, well harmonizing with the other parts. The brass corners of the radiator, formerly polished, are now japanned and the crown sheet which extended forward from the radiator is now finished with a heavy roll flush with the radiator. Brackets containing sockets for the front guard braces, located at the side of the radiator and on top of the frame side members, gracefully complete the finished effect.

The screw and nut principle for steering is continued, the nut being somewhat longer to give greater wearing surface and the steering parts in general are slightly heavier and stronger. The guards are carefully shaped to obtain the most harmonious appearance. The guard fillers extend to the top of the frame, entirely covering the running board supports. These fillers are secured to the frame by acorn nuts and bound at the running board edge by an aluminum strip. An aluminum toe guard protects the filler on the forward left side.

The interior of every tonneau is completely trimmed with leather; commodious pockets are attached to the doors; the surface of the front seat back, usually varnished, is protected by a leather pad and the space below is utilized as a pocket for the top side curtains. Seat backs of Rambler Sixty-five are higher.

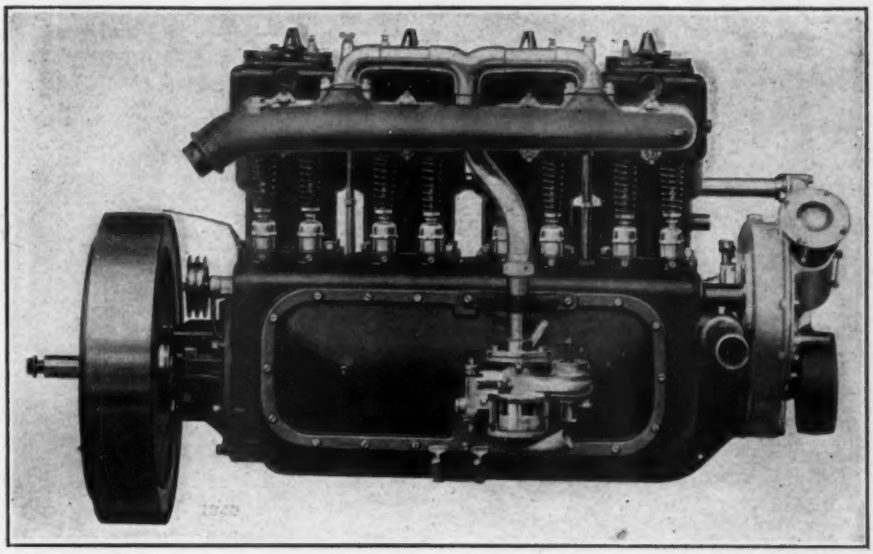
The headlights on the 45-horsepower chasses are one size larger than last year, being 8- and 9-inch sizes for the five- and

seven-passenger models. These and the side lamps are placed higher, adding to the appearance and affording better light. Side and tail lamps for all models are combination electric and oil. The current of these lamps is furnished by 6-80 storage battery and they are operated by a three-point push switch.

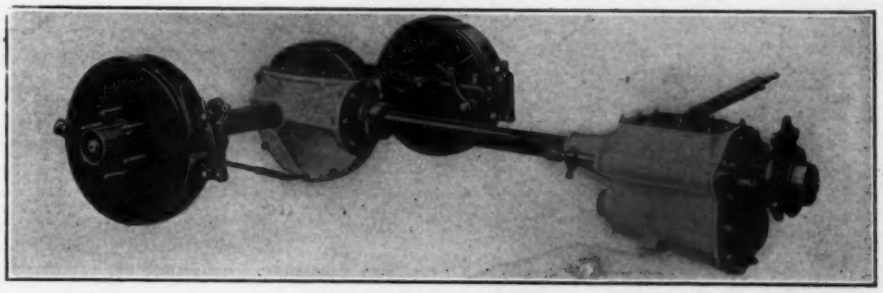
Methods of Testing

The final completion of the laboratory, some of the details of which were described in THE AUTOMOBILE some time ago, consummated the plan that assures detailed and exact testing of every Rambler car manufactured in addition to a proper investigation of the units of each automobile before they are assembled into the respective cars. This laboratory situation is of far-reaching importance. It may not be generally understood that the testing out of a considerable number of automobiles every day demands the use of a vast amount of equipment, and a large number of skilled men, under ordinary conditions, the cost of which becomes so great that it is something of a question as to whether or not this part of automobile building, taking it in general, has been afforded the care and attention it naturally deserves.

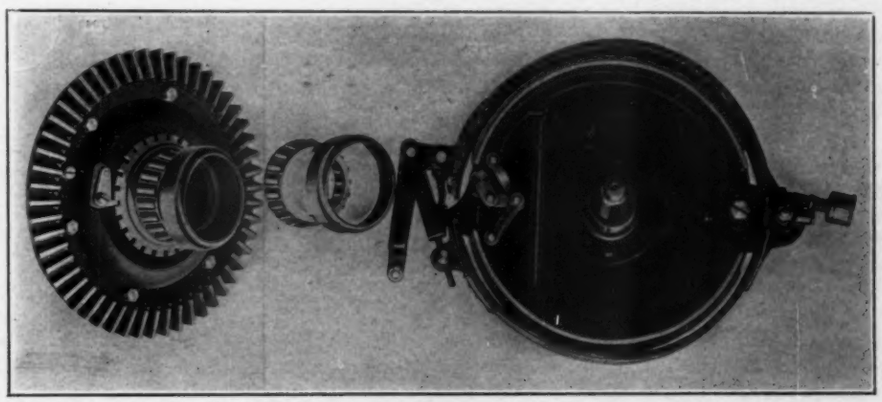
The new laboratory in the Rambler plant possesses several innovations that are labor-saving, hence the more accurate, it being the case that the "personal equation" is the most to be feared in any test room. It is not impossible to find here and there a skilled man who will do good and accurate work every day, but it is substantially impossible to rely upon the skill, judgment, and reliability of a plurality of men. In the Rambler test room every motor is brought in and put down on a stand, there being enough of these stands to handle the daily output of the plant with sufficient promptness to prevent a slow-down in the regular shop work while tests are being made. The test stands are provided with electric motors, one for each, which motors are so designed and connected up that they will run either as dynamos delivering current for storage batteries, or as motors deriving electrical energy from the same storage battery, in which event the motors drive the gas engines to be tested.



Model 64 and 65 engine, showing new carbureter and location, new intake pipe with priming plugs over intake valves



Transmission and rear axle construction showing new style brakes



1911 Rambler brakes and squared rear axle, also differential

As each motor is delivered to its test stand it is profusely lubricated, and the electric motor is connected up to a tumble shaft, all of which is done in a moment, and the motor to be tested is driven by the electric motor until the electrical instruments employed for measuring show that the friction of the motor to be tested is down to its proper level. After this, the motor to be tested is made the driving unit, and the electric motor is turned into a dynamo by means of which the motor to be tested is loaded and the current delivered from the dynamo is passed through measuring instruments for the purpose of determinating the amount of a load. The electric energy thus generated by the motors undergoing the test is utilized to charge the storage battery, and in this way every motor that is tested is put through its paces speedily; moreover, the actual waste of energy in the whole system is limited to that which is dissipated by friction and heat losses.

Each motor, before it is permitted to do any work at all, must show on the electrical instruments that the friction losses, internal within itself, are down to a certain standard; it must also be shown that the motor is in a good state of kinetic balance, and the performance of the mechanisms must be noiseless with entire freedom from gas leaks and other recognized indications of poor mechanical work. As the motors come off the test stand they are checked up as to timing and thermic performance generally; in this class of testing the manograph is employed as the sole guide, it being understood that it is utterly impossible to reach a conclusion of any worth from the thermic point of view without employing the manograph. It was found, after some experience, that the ordinary forms of manograph, while they evolved a certain amount of accuracy, were far too slow.

Model M 1911. Fore-door type of touring car, seating seven passengers, showing a well-fitted top folded down, and other advanced features

Pullman 1911 Announcement

TWO INCHES ADDED TO THE WHEELBASE OF ALL MODELS; MATERIALS USED ARE MUCH REFINED.

SO entirely satisfied is the Pullman Motor Car Company, of York, Pa., that its 1910 product was close to perfection that in the output for 1911 will be incorporated only those minor mechanical changes and refinements in design which the natural progress of a year would seem to demand. The numerous road and track successes of the Pullman during the past year would seem to warrant this course.

As was the case in 1910, the 1911 list will include Models K, O, and M—Model K registering 32.4 horsepower (A. L. A. M.); Model O, 26 horsepower, and Model M, 44.1 horsepower. Of Model K there will be three body models—touring car, seating seven; roadster, three, and toy tonneau, four. There will be the same number and types of body designs of the O model—seating four, three and two, respectively. Model M will be represented by a touring car with a capacity of seven and a toy tonneau seating two. The upholstery is luxurious, hand-buffed leather is used, and comfort is looked to with care and precision.

In the matter of wheelbase length, all three models have been added to to the extent of 2 inches as compared with last year—K to 114 inches, O to 110 and M to 126. The tread has been reduced in all three models 1-2 inch to 56 inches.

MODELS	Price	H.P. A.L.A.M.	BODY		MOTOR				COOLING		IGNITION		Lubrication
			Type	Seats	Cyl.	Bore	Stroke	Cyl. Cast	Radiator	Pump	Magneto	Battery	
Pullman K-11...	$2000	32.4	Tour'g.	7	4	4½	4½	Single.	Tubular.	Cent'fl...	Bosch...	Battery.	Pump..
Pullman K-11...	2000	32.4	R'ster..	3	4	4½	4½	Single.	Tubular.	Cent'fl...	Bosch...	Battery.	Pump..
Pullman K-11...	2000	32.4	T.Ton...	4	4	4½	4½	Single.	Tubular.	Cent'fl...	Bosch...	Battery.	Pump..
Pullman O-11...	$1650	26.	Tour'g.	4	4	4 3/32	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Battery.	Pump..
Pullman O-11...	1650	26.	R'ster..	3	4	4 3/32	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Battery.	Pump..
Pullman O-11...	1650	26.	T.Ton...	2	4	4 3/32	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Battery.	Pump..
Pullman M-11...	3500	44.1	Tour'g.	7	4	5¼	6	Single.	Cellular..	Cent'fl...	Bosch...	Battery.	Pump..
Pullman M-11...	3500	44.1	T.Ton..	2	4	5¼	6	Single.	Cellular..	Cent'fl...	Bosch...	Battery.	Pump..

Information in Relation to Model K 1911 Motor

This motor is shown in two views, Fig. A being the left-hand side and Fig. B being the right-hand side. Referring to Fig. A, the magneto M1 rests on a shelf S1 in front of the arm A1. The magneto is driven from the shaft S2, which extends out of the half-time gear box B1, but the water pump W1 intervenes and takes its power from the same shaft. Both the magneto and the water pump are flexibly mounted, and Oldham joints J1 and J2 are utilized to bring about the condition of flexibility desired and to compensate for minute differences in alignment, it being the case that absolute accuracy cannot even be found in a chronometer. The water pump has a drain cock D1 at the lowest point in the water system, and the water intake passes up to an enlargement around the shaft, while the water manifold M2 flanges off of an extension from the pump in the upward direction, leading the water into the cylinders at a point just under the exhaust manifold E1. Attention is called to the accessibility of the exhaust manifold flange bolts B2, of which there are two for each leg. The cylinders C1, C2, C3 and C4 are cast individual of the T-type, bringing the inlet and exhaust valves on opposite sides, but there is one point which should not be overlooked in scanning the scenery of this motor; the cylinder jackets are cast open on adjacent sides, so that the respective cylinders are flanged F1 to each other, the two outside cylinders having covers C5 and C6. This school of design affords certain advantages. A trip to the foundry where the cylinders are cast, and a short study of the ramifications in the foundry, will lead up to knowledge of the fact that good, sound castings are only to be had if the gases are tapped away, and it is a recognized fact in foundry work that to be able to dispose of the gases it is necessary to provide an exit for them. When the water jackets are cast all around it is extremely difficult to keep the gases from shooting through the solidifying metal instead of passing around to the small holes that are left from core prints, etc. But by casting the cylinders in the manner as here shown a large opening is afforded on each side of each cylinder for the disposal of the gases that form, and bolting the cylinders to

each other in this way lends extra stability to the structure, nor can it be claimed that the cost or complication is increased at all.

Referring to Fig. B of the right-hand side of the motor, it shows the Stromberg carbureter C1 with its manifold M1 and an accommodation piece A1 intervening. This brings the carbureter on the side opposite to the magneto, which is as far away from the source of an ignition spark as it is possible to get. This view offers a chance to appreciate the accessibility of the timer T1, which is between the third and fourth cylinder and above them, taking power from the vertical shaft V1. Breathers B1 and B2 for the crankcase come up out of the arms through a tortuous passageway so that the lubricating oil within the crankcase is prevented from shooting out through the orifices of the breathers. The flywheel F1 is of sufficiently large diameter considering its face and the thickness of the rim to afford the fullest measure of "flywheel effect" without reaching into the danger zone from the point of view of extreme fiber strain in the rim section due to centrifugal force. The four cylinders of the motor, in view of the method of flanging, occupy the minimum space, and the motor is rated at 35 horsepower by the maker, the cylinders having a bore of 4 1-2 inches and a stroke of 4 3-4 inches. The magneto is a Bosch with a battery auxiliary, and lubrication is by means of a circulating pump. The cone clutch C2 shows nested in the flywheel, and the actuating mechanism, including the clutch spring, are within the housing H1.

Lay-out of the Model K 1911 Chassis

In this view the radiator R1 is on the center line of the front axle A1, and the motor M1 occupies a position which brings the flywheel F1 at the point of narrowing N1 of the chassis frame. The universal joint U1 is between the motor and the transmission gear G1. The propeller shaft P1 is provided with universal joints U2 and U3, the latter being close to the live rear axle A2, and torsion is compensated for by a torsion rod T1, which is anchored to the cross-member C1 with a shackle S1. Both front and rear springs are of the half-elliptic type, and the rear springs S2 and S3 are unusually long with wide plates, thus inducing the fullest measure of flexibility, coupled with the proper snubbing function, so that the car rides with freedom from undue vertical bounce. The live rear axle is of symmetrical exterior, of great strength, but light, and by a study in straight-line design it was possible to make the links and levers controlling the brakes in the drums of the rear wheels straight and fair. The equalizer E1 for the service brake comes inside the chassis frame, and the rods for both the service and emergency brakes are dead straight, due to the use of extension pieces E2 and E3, which are flanged and bolted to the chassis frame at a point just in front of the front anchorage of the rear springs. The front axle is of the I-section, with stout knuckles and through pins, and the steering drag-rod D1 comes in a protected position above the axle, while the cross-rod C2 is straight and behind the front axle. There are other nice features of design that will be apparent to the reader upon inspecting the plan view.

Design of Model K 1911 Transmission Gear

This gear is of the three-speed and reverse selective type with flanges F1 and F2 on the sliding gear and final drive shafts, respectively. A universal joint is used between the transmission gear and the clutch, one member of which, U1, is shown, indicating a mating flange and the method of bolting. The sliding gear shaft S1 has integral flutings, and the sliding gears G1 and G2 are splined to match. The sliding gear G1 meshes with mating gears G3 and G4 on the lay-shaft S2, while the sliding gear G2 meshes with the gear G5 on the lay-shaft S2, and in the opposite direction a dog clutch D1 is brought into engagement, making the high-speed direct-drive. Motion is imparted to the lay-shaft S2 by means of the master gears G6 and G7. The sliding gears G1 and G2 are actuated by forks F3 and F4 and motion is imparted to these forks by means of the selector bars B1 and B2. The shafts float on Hess-Bright annular type ball bearings B3, B4, B5 and B6. The gears are six diametral pitch with wide faces and are turned from bars of chrome vanadium steel, after which they are hardened and subsequently heat-treated to impart kinetic qualities without destroying the hard shell. The prime and lay-shafts are of chrome vanadium steel also.

The fenders are rakish, made from pressed steel, with the running boards enclosed. Dashes are mahogany, brass bound.

The bodies are of wood and aluminum, upholstered in hand-buffed leather. The gasoline tank is located underneath the front seat. Each

Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
	Type	Speeds	Location	Drive				Crankshaft	Transmis'n	Axle		Front	Rear
Cone....	Selecti'e.	3	Frame..	Shaft...	114	56	Steel....	5 Plain.	Ball....	Roller..	.....	34x4	34x4
Cone....	Selecti'e.	3	Frame..	Shaft...	114	56	Steel....	5 Plain.	Ball....	Roller..	.....	34x4	34x4
Cone....	Selecti'e.	3	Frame..	Shaft...	114	56	Steel....	5 Plain.	Ball....	Roller..	.....	34x4	34x4
Cone....	Selecti'e.	3	Frame..	Shaft...	110	56	Steel....	3 Plain.	Ball....	Ball....	.....	34x4	34x4
Cone....	Selecti'e.	3	Frame..	Shaft...	110	56	Steel....	3 Plain.	Ball....	Ball....	.....	34x4	34x4
Cone....	Selecti'e.	3	Frame..	Shaft...	110	56	Steel....	3 Plain.	Ball....	Ball....	.....	34x4	34x4
Cone....	Selecti'e.	4	Frame..	Shaft...	126	56	Steel....	5 Plain.	Ball....	Roller..	.....	36x4½	36x4½
Cone....	Selecti'e.	4	Frame..	Shaft...	126	56	Steel....	5 Plain.	Ball....	Roller..	.....	36x4½	36x4½

Model O 1911. Five-passenger touring car with an overhanging cowl, fitted with a top folded down, showing a roomy tonneau

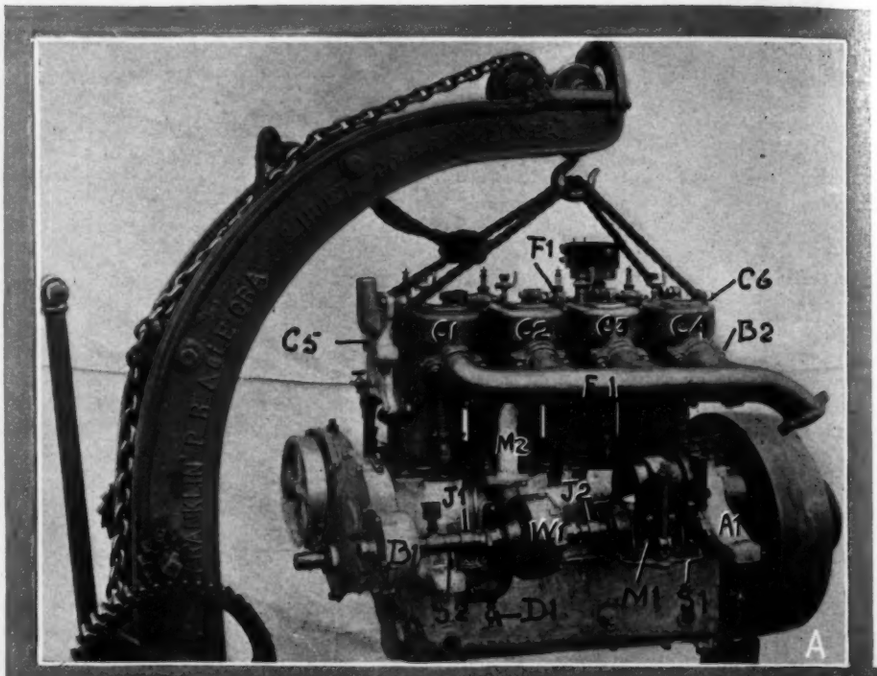
car comes equipped with two gas headlights, gas generator, two oil side lamps, an oil tail lamp, horn, tools, coat and foot rails.

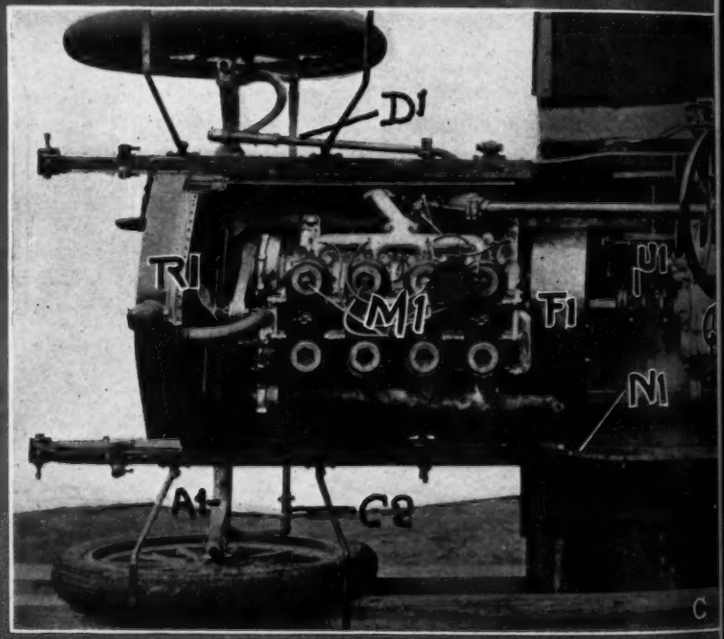
The standard color is "Pullman red," a very durable and distinctive shade. Dark blue with straw-colored wheels or black with wheels of similar tint are among the options.

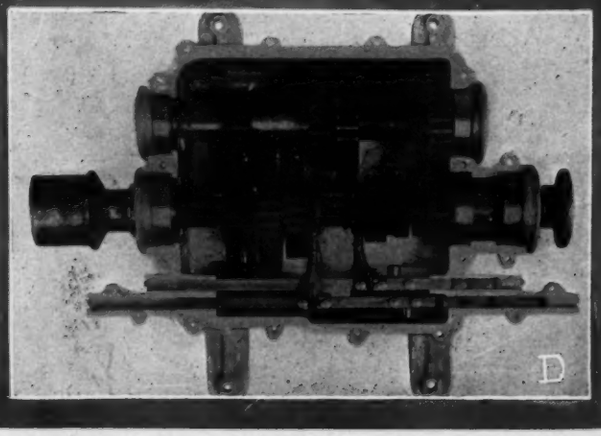
The tire equipment of Models K and O calls for 34 x 4 front and rear, the Model M cars being equipped with 36 x 4 1-2 front and rear.

From the price standpoint, the Pullman 1911 proposition is identically the same as that for 1910—$1,650 for Model O, $2,000 for Model K, and $3,500 for Model M.

The illustrations as presented on this and the following page, if subjected to a close examination, will disclose to the interested reader many points of mechanical refinement on a basis of harmony that were not fully disclosed by discussion, and it is pointed out that the motor as it is here shown is picked up by a system of travelers that indicate in a small measure the excellence of the equipment that is used at this plant in the manufacture of automobiles, moreover, it is fitting to state that the cars are very completely made by the company, rather than to be classed as a product that is assembled from parts that, for assembled automobiles, are purchased elsewhere.







A—Left hand side of motor. B—Right hand side of motor. C—Plan of

Automobile Colors

By M. C. HILLICK

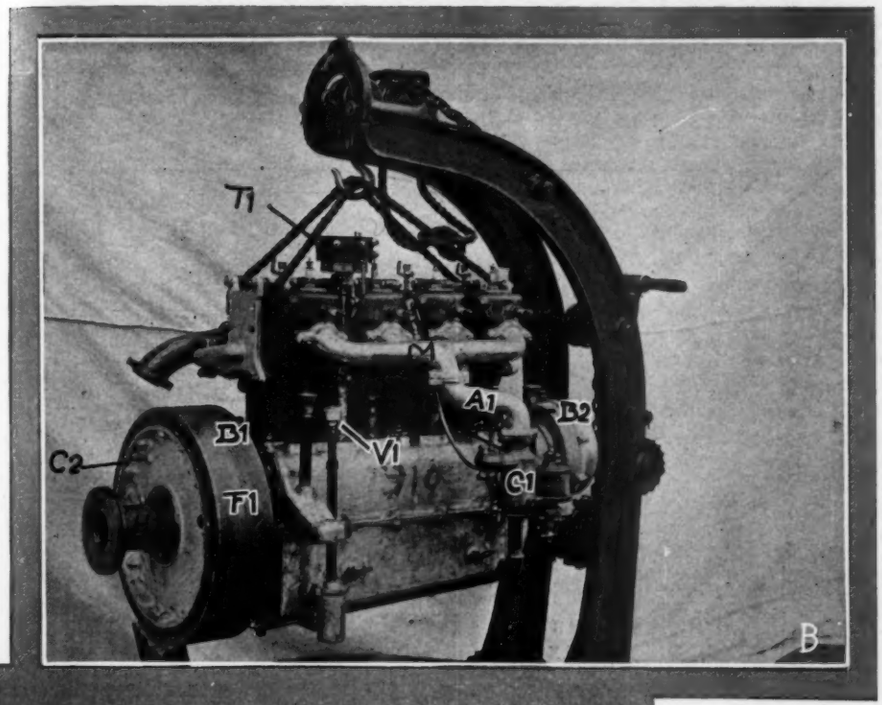
Doubtless the automobile owner as well as the automobile painter will be interested in the subject of popular colors for the season of 1911. With the march of the season, of course, will come not a few color novelties intended to appeal to a class of buyers intent upon securing decidedly unique or sensational pigment effects. The great majority of colors, however, destined to be in evidence upon the horseless carriage next year will be the colors that have found favor this year, or pigments closely related to them.

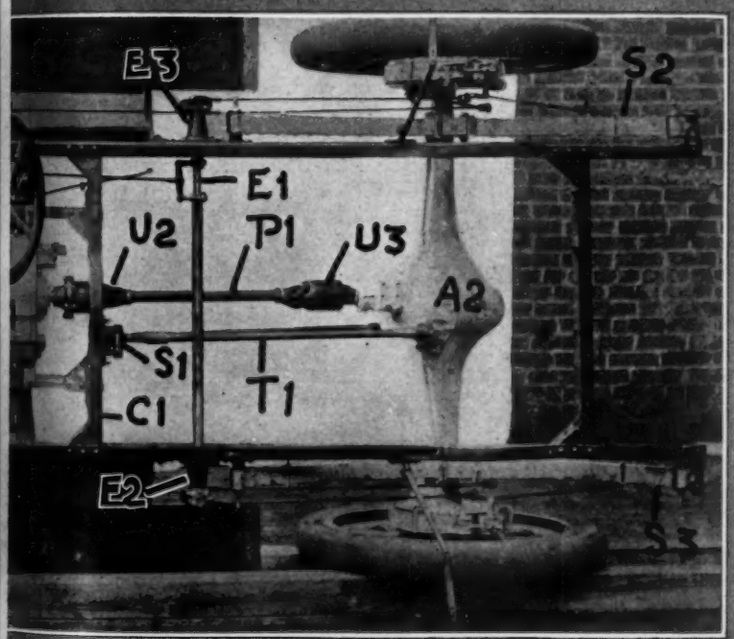
Among such colors the lakes must be reckoned with. The lakes comprise an interesting and numerous family of pigments, many of them rare and costly, and all of them charming in their wealth of color effects.

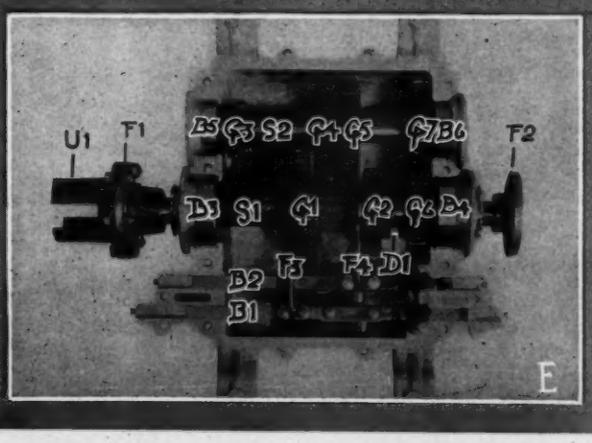
The principal lakes are maroon, crimson, Chatimuc, carmine, Munich, scarlet, mauve, madder and purple. As illustrating the extent to which many of these lakes are now being used in automobile work a color salesman recently stated to the writer that whereas he formerly sold lakes in one-pound lots he is now selling them in 50-pound lots, and that, too, on a basis of from $3 to $5 per pound.

The first step in preparing the surface for the lake has to do with working out a fine, smooth surface condition. It is an axiom that the finer the surface the richer the color effect, which in large part is true. To get this fine, level and smooth surface is not always easy over a surface holding its old paint structure in fair condition, and upon which it is not feasible to apply roughstuff. In case of the application of the roughstuff over the old paint fabric puttying should at least be done upon the first coat of surfaces in order to fill up all fractures, cavities and shattered bits of wood. Then apply over this putty a couple of coats of roughstuff, which, in due course, are rubbed down to a level and smooth surface. The work is now ready to be coated in with color.

Should the surface be a new one from the wood up it is first primed, then coated with two good coats of lead, next puttied,







Model K chassis. D—Model M transmission. E—Model K transmission

and then bodied up full and strong with four coats of roughstuff and capped off with a stain coat for the guidance of the workmen invested with the duty of rubbing the stuff out to the proper surface. Having reached this point we are ready to convey either the old or the new surface forward to a finish in practically the same order, and as follows:

For Munich lake first lay on a coat of Indian red saddened a bit by adding a little drop black. Then apply a coat of medium wine color thinning the color out to dry down flat. The following day take some of the lake proper, break it up in turpentine alone, and continue to thin to the proper working consistency with this fluid. With this flat color the surface, laying the pigment on with a camel's hair brush. Permit the coat to dry until the day following whereupon break, say, an ounce of the lake up finely in turpentine, and then to the mass use a full pint of elastic rubbing varnish, stirring all the ingredients thoroughly. With a half elastic, fine bristle brush, flat, flow the surface with a generous coat of the lake. After two days, rub the gloss from this coat with water and No. 0 pulverized pumice stone, using a felt 1-2 inch perforated rubbing pad. Then to a pint of the elastic rubbing varnish add a bare half ounce of the lake, stirring to an intimate incorporation of all the ingredients. Allow three days for this coat to nicely harden after which flat down uniformly as above. Then stripe, if so desired. The day following apply a clear coat of the elastic rubbing varnish which, after four days of drying out, may be nicely and uniformly rubbed down, washed up, touched up where necessary, and then finished with a strictly high-class finishing varnish.

English scarlet lake may be provided for by first using a peach blow colored pigment on top of which apply a coat of English vermilion made up with enough varnish to hold the pigment intact and give it the right working property. Make a glaze coat of the English scarlet lake and apply directly over this. English crimson lake works nicely and with admirable effects over quite the same ground, or with a ground of Tuscan red.

In the line of beautiful pigments none surpass No. 40 carmine, a lake of such magnificent effects that it is the popular idol.

This color is obtained in at least three different shades, this feature alone being important when arranging to try the pigment out. The one shade, say that of deep carmine, may over different grounds be made to show both light and dark color. For a deep No. 40 carmine build a ground of English Indian red. Over this ground next lay a coat consisting of one part deep wine color and two parts of the carmine, thinning the two pigments down to a brushing consistency with turpentine, adding as a binder a teaspoonful of new linseed oil to a pint of the thinned color. Over this color flow a glazing coat made up of elastic rubbing varnish stained with No. 40 carmine in the proportion of 3-4 of an ounce of pigment to a pint of varnish.

For a medium deep shade of carmine use light Tuscan red, laying the first coat of carmine as a flat color, then glazing.

For a light carmine lay the carmine first as a flat color then as a glaze color over a ground of English vermilion. In the use of carmine success depends in no small degree upon the quality of the pigment. Not a little of the No. 40 French carmine being sold to automobile painters and manufacturers, while chemically pure, has a muddy, lusterless tone, a defect which condemns it for good work. The carmine pleasing alike to critical buyers and connoisseurs carries a striking blood red tone, unapproachable and inimitable.

Digest

EXTRACTS FROM BEST FIFTY FOREIGN JOURNALS DEALING WITH SUBJECTS RELATED TO AUTOMOBILE ENGINEERING—A FORMULA FOR CRANKPINS—HEATED SCRAPER FOR REMOVAL OF PAINT

D. O. Barrett gives a series of formulas and diagrams for the calculation of crankshafts for single-cylinder motors of the four-cycle type and up to 75 horsepower. These have been applied in practice to motors of up to 60 horsepower and no failings have been noted in the shafts so calculated.

(1) *Shaft Diameter.*—The shaft's resistance to torsion is proportional to the cube of its diameter D, while the torsion moment applied to the shaft by the force of the explosion is proportional to the product of the bore B squared and the eccentricity of the crankpin, the latter being one-half of the length of the piston stroke S. From this:

$$\frac{B^2 \times \frac{1}{2} S}{D^3} = c.$$

The safety factor c, as used in practice, varies from 10 to 19 and averages 15.

The stroke S may be considered as a linear function of the bore B; S equals aB. Hence:

$$\frac{B^2 \times \frac{1}{2} aB}{D^3} = c = 15.$$

This gives for the diameter:

$$D = \frac{\sqrt[3]{a \times B}}{30}$$

In motors of the powers under consideration the stroke usually averages 1 1-2 times the bore, but it varies from 1 1-4 to 2 times the bore. For a equal to 1 1-25, D becomes $0.347 \times B$. For a equal to 2, D becomes $0.405 \times B$.

(The original here gives a diagram showing the shaft diameter for various bores and strokes, in inches.)

(2) *Dimensions of Crankpins and Bearings.*—In order to obtain the best results the mean pressure on the pin must not exceed 28 kilograms per square centimeter of projected surface. There is here allowed a mean pressure of 27.3 kilograms. Let l be the length and D the diameter of the pin, P_1 the mean pressure, of 27.3 kilograms. The total mean pressure equals the piston pressure per square centimeter multiplied by the bore B. Hence:

$$P_1 \times ld = 0.7854 \times B^2 \times \text{mean total pressure.}$$

Assuming this mean total pressure to equal 5.25 kilograms per square centimeter, one has:

$$ld = \frac{0.7854 \times B^2 \times 5.25}{27.3} = 0.151\ B^2.$$

Usually l is made equal to d, and this means that d^2 equals $0.151 \times B^2$, or d equals 0.39 B.

If this formula gives d a smaller value than that of D, it should not be made smaller than D, but at least equal, and better, as high as 1.125 D.

For the bearings the dimensions should be:

The diameter, $d_1 = 1.1\ D$ and the length $l_1 = (1.75 \text{ to } 2) \times D$.

(3) *Dimensions of the Crankcheeks.*—Generally rectangular, these work against a beam fixed at one end. The resistance is directly proportional to the width b and to the square of the thickness t and inversely proportionate to the length, which latter is a direct function of the stroke S. The stress on the end of the cheek is proportional to the square of the bore, hence:

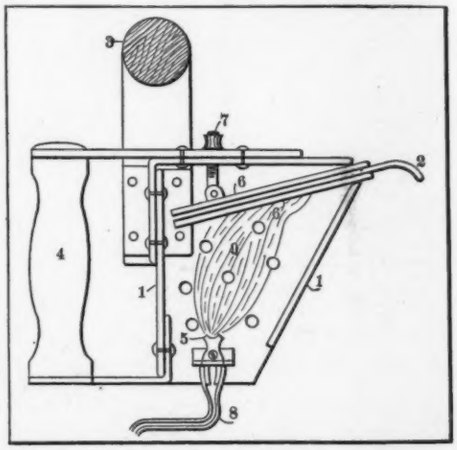
$$\frac{bt^2}{B^2 S} = c_1.$$

The constant c_1 obtained by averaging the values found on a number of motors, equals 0.045. The thickness t is usually 2.2 b and S equals aB. Hence:

$$\frac{t^2}{2.2 \times aB^2} = 0.045 \text{ or } t = B\sqrt[3]{0.999 \times a}$$

It is now easy to trace a diagram showing the value of t, as expressed in functions of the bore and the stroke, for the various customary values of a.—From *Technique Moderne* as quoted in *La Technique Automobile et Aérienne*, Sept. 15.

For the removal of paint or enamel from large metal surfaces, for which work either the blowtorch or a special chemical lye is usually employed, unless a sandblast is available, a method is recommended which is said to offer the advantage of always leaving the metal surface uninjured and in suitable condition for a new coat of paint. It also has the advantage of being less messy than other processes; it develops no fumes and may be carried on at any place in a factory and by unskilled workers. It consists simply in using a heated scraper. In the accompanying illustration 1 represents the sheet iron boxing, 2 the scraper, 3 and 4 the handles for operating the tool, 5 a gas flame jet, 6 guide irons for holding the scraper, 7 a screw and nut for adjusting the angle of the guide irons, 8 a flexible tube to the gas supply, 9 ventilation holes in the sides of the box.—*Metall Technik*, Aug. 27.



Heated scraper for removing old paint

Braking with the Motor in the Hills

An old tourist who has traveled much in the Alps and Pyrenees, in Italy, Switzerland and Tyrol, describes how he utilizes the compression in his motor for braking without drowning the spark plugs in lubricating oil and inviting fouling. He has a 20-28 horsepower vehicle weighing in touring condition and with two travelers 1,980 kilograms. At the top of the admission tube which comes from the carbureter he has made an opening one centimeter wide and three centimeters in circumference, which opening he can open and close from his seat. When he sees that he is going to reach the top of a hill and it dips down on the other side, he closes his gasoline pipe—from the seat—about fifty meters before reaching the top and relies on the fuel in the carbureter to take him up. Now, to descend, he drops to low gear (or second), opens the above-mentioned opening in the admission tube and leaves the contact of the magneto as for ordinary driving. Despite the excess of air he may have one or two explosions from the remaining gasoline in the carbureter, and he withdraws the magneto contact but restores it when the explosions cease for want of gasoline.

Selden Mechanically for 1911

PRESENTING THE MOTOR IN DETAIL, AFFORDING DIMENSIONS OF THE CRANKSHAFT AND THE AXLES, ETC.

THIS coming year the Selden car will be placed at the disposal of the clientèle of the Selden Motor Vehicle Co., of Rochester, N. Y., in five models, ranging in price from $2,250 for the Model T touring car to $2,600 for the Model 40-S fore-door touring car, the details of the respective models being given in the table as herein presented. Dismissing the commercial situation as it involves the body types, color of paint, and other matters, which the customers will readily be able to dispose of themselves if they inspect the cars, it will be the purpose here to show in precise detail some of the important mechanical details of design of the machinery part of the Selden make of automobiles.

The motor is identical in the several models of cars and is presented in a part-sectioned elevation in Fig. 1. This motor has four cylinders, cast in pairs, with T-heads, bringing the valves to one side. It is rated at 36.1 horsepower (A. L. A. M.) and the cylinders have a bore of 4 3-4 inches, with a stroke of 5 inches.

As Fig. 1 shows, the motor is of the water-cooled type, with integral jackets, excepting that the top is open and a separable top piece is bolted to flanged faces, so that the exterior of the domes of the cylinders may be gotten at and cleaned off, even to the extent of scraping, if in the course of time scale should form over these surfaces. The water is circulated by means of a centrifugal pump, the latter being gear driven, taking power from the half-time gear train. Ignition is by the type Bosch DR-4 magneto, with a storage battery as a source of auxiliary supply; the details of the ignition system will require no further attention here, it being the case that the interested reader may glean a better insight into the magneto ramifications by studying the literature as issued by the Bosch Company direct, which covers the subject much more thoroughly than is possible here, where the magneto is but one of the many details of construction to be considered.

Lubrication is by splash with a means for maintaining a constant level. Among the important details of the motor as shown in Fig. 1, mention will be made of the fact that the cylinder castings are of close gray iron, symmetrical in design, and are machined and otherwise brought to a precision of bore that assures tightness of compression, this condition being accentuated by the use of well-designed piston rings, that are fitted on an interchangeable basis. The valves are of the bevel seat type,

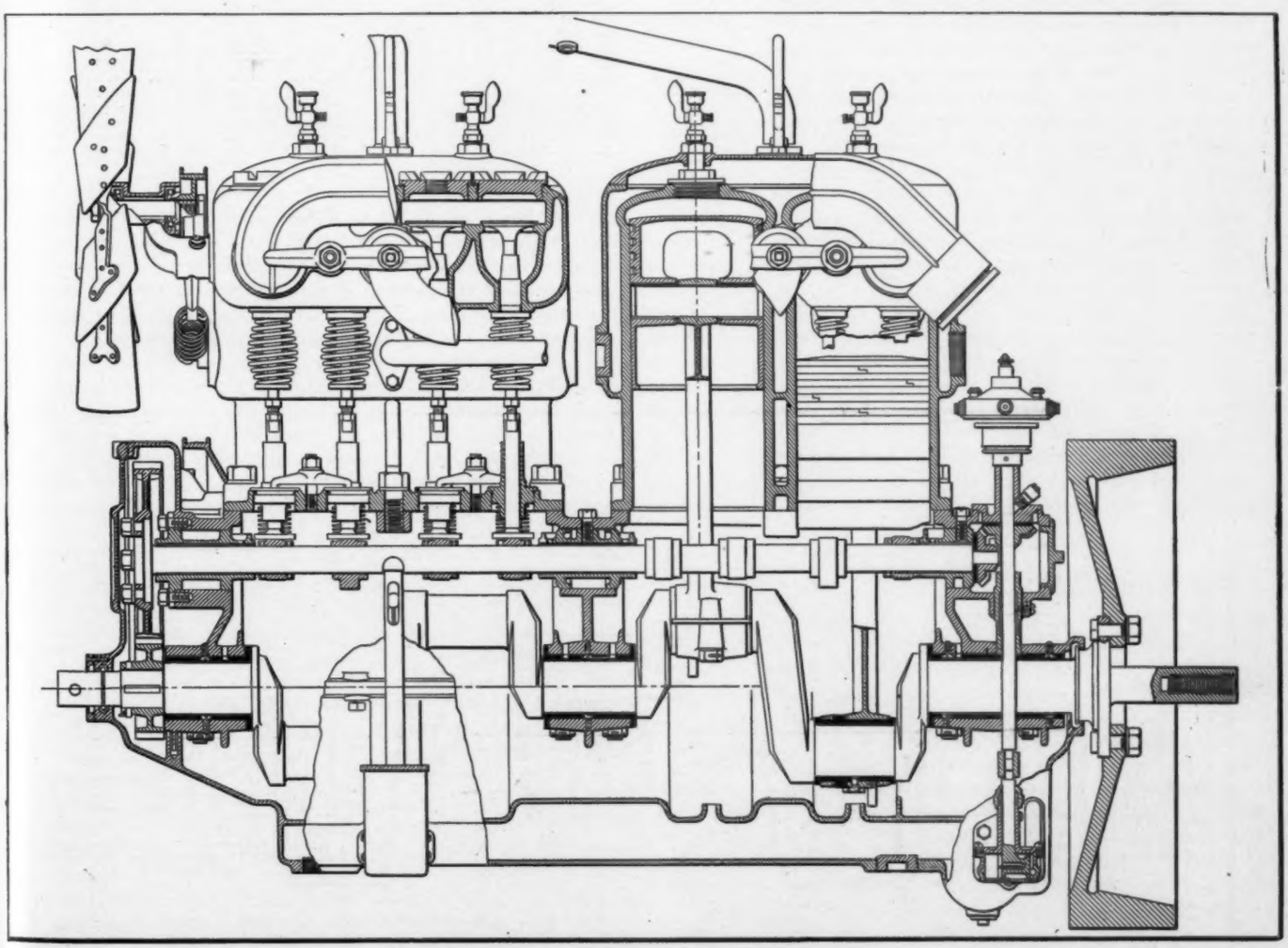


Fig. 1—Engine showing in partial section, partial elevation, mechanical details being exactly reproduced from working drawing

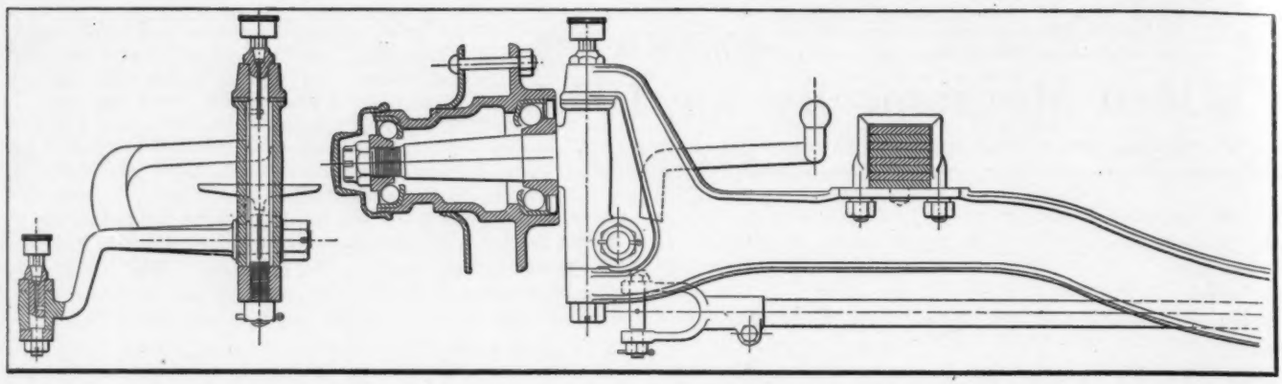


Fig. 4—Front axles are mounted on ball bearings of large diameter placed wide apart, and arranged to take thrust, also

and the water-jacketing around the valve seats is such that a uniform temperature obtains at every point. The valve stems are of large diameter, and at the point of intersection of the mushrooms with the stems extremely liberal fillets are provided, so that the heat that is wiped out of the contacting gases by the mushrooms is permitted to travel down the large area steps, from whence it is tapped away by the cold walls over a considerable area. This is a point that would escape the notice of a novice, until, in the course of time, the valves, if otherwise designed, would warp and resist being ground into tightness, due to the fact that the stems would curl up in response to unequal heat conditions, and it would be impossible to grind the valves into a condition of tightness. The valves are of large diameter, relative to the bore of the cylinders, so that at each inspiration the amount of gas taken in is relatively high, and the compression is so regulated that the power stroke is vigorous, but care is taken to maintain a condition of harmony of relation from a thermic point of view. The result, in practice, is that the motor has life, accelerates smartly, but the curve of torque is flat top, which has the advantage of affording a substantially constant range of power over a wide range of performing speed, and a thermal efficiency that makes it mark favorably on the fuel consumption. By carefully regulating the compression the troubles due to carbon precipitations are eliminated, but by using large area valves, and looking sharply to the condition of carburetion in the presence of efficient cooling the weight of mixture that is taken in per inspiration is relatively high, and the power of the motor is not only marked but this power holds over the wide range of speed that good practice demands. It is common opinion that silence of performance is due to mechanical accuracy in the machining and assembling of the parts; it may be as news to some, even discriminating automobilists, to learn that silence of performance depends upon the harmony of thermic relations as well as upon mechanical accuracy.

In view of the considerable cost of a crankshaft, and the importance of the service it renders in the motor, coupled with the fact that if it fails in service it is almost like losing a whole automobile, it is preferred to reproduce the crankshaft with all its dimensions just as the drawings are sent to the shop where the crankshafts are made, and in this way it will be possible to show not only the dimension of the sections and the bearings but the limits of tolerance within which the workmen must stay in the production of crankshafts. The main bearing is 5 5-16 inches long by 1 7-8 inches in diameter, so that the projected area of this bearing is sufficient and to spare to handle not only the torquing of the motor, but the gyrations of the flywheel as well. The bearing at the opposite end, since it has to do very much less work, is reduced to 1 3-8 inches in length, by 1 7-8 inches in diameter. The mid bearing is 3 3-8 inches in length by 1 7-8 inches diameter; this bearing has to shoulder a somewhat greater responsibility than the front bearing, but it has to do considerably less work than the bearing which supports the flywheel. The connecting rod bearings, that is to say the crankpins, are 2 7-8 inches long by 1 7-8 inches in diameter, and since

SPECIFICATIONS OF SELDEN

MODELS	Price	H.P.A.L.A.M.	BODY		MOTOR				COOLING		IGNITION		Lubrication
			Type	Seats	Cyl.	Bore Inches	Stroke Inches	Cyl. Cast.	Radiator	Pump	Magneto	Battery	
Selden 40 R.....	$2500	36.1	R'dster.	2	4	4½	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Storage..	Splash..
Selden 44.....	2500	36.1	Fd.Rst.	4	4	4½	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Storage..	Splash..
Selden 46.....	2600	36.1	Fd.To..	6	4	4½	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Storage..	Splash..
Selden 40 S.....	2600	36.1	Fd.Tg..	7	4	4½	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Storage..	Splash..
Selden 40 T.....	2250	36.1	Tour'g..	5	4	4½	5	Pairs..	Tubular.	Cent'fl...	Bosch...	Storage..	Splash..

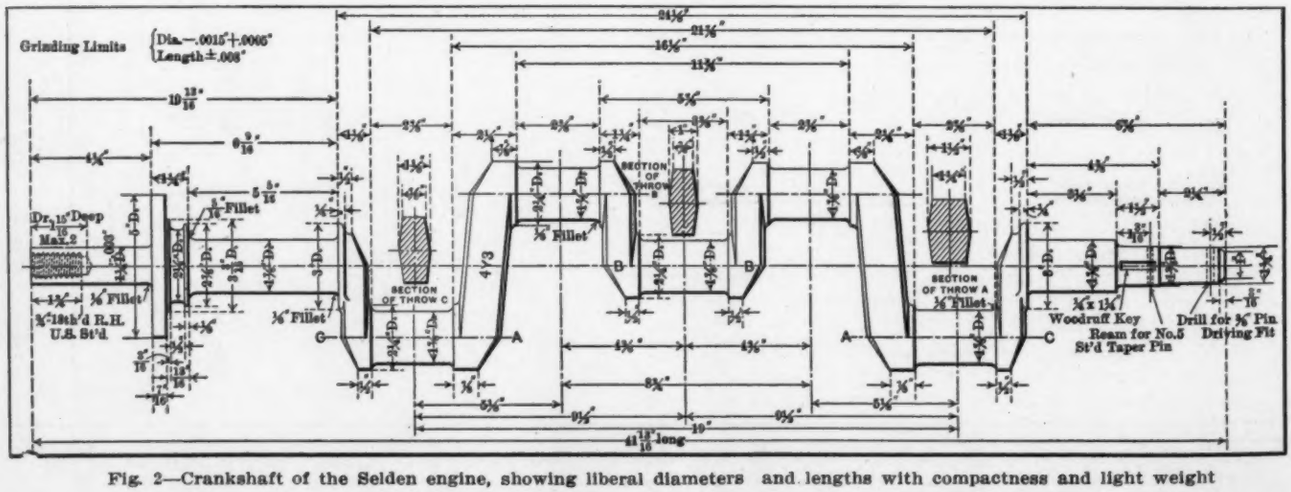


Fig. 2—Crankshaft of the Selden engine, showing liberal diameters and lengths with compactness and light weight

the work coming on each of them is the same they are all made alike. An examination of the section of the throws at A, B and C will afford information as to the rigidity of the crankshaft, especially if account is taken of the excellence of the material employed therein. At the upper left hand corner of this illustration it states that the grinding limits are, for diameters, from minus 0.0015 to plus 0.005, whereas, the limits of tolerance for lengths are plus or minus 0.008 (inches in each case). It is not impossible for good machinists on proper grinding equipment to keep within these limits of tolerance but it is not to be expected that the ordinary run of work, in the absence of a rigid inspection system, will adhere to this exacting standard.

As the tabulation shows, the transmission is of the three-speed and reverse selective system. Fig. 3 is a plan in part section of the same, in which the ratios of gears are given, indicating that the direct drive comes on high speed, which is obtained by sliding the sleeved second speed gear, the latter having backed off dog projections on its face, which engage with similar projections on the face of the master gear in juxtaposition. The master gears have 18 and 33 teeth respectively so that the layshaft travels at a little over half the speed of the main shaft. The low speed pinion has 18 teeth, and a reverse pinion has 14 teeth with a 16-tooth idler. The spindles are short in centers, made of a selected grade of material, and roll on Timken Roller Bearings with closures to prevent dust from coming in or oil from seeping out. The universal joint at each end of the main shaft slips over a squared end, and the block of the joint is broached square, and scraped to a press fit. The gears, besides being of large diameter, have liberal faces, and the material used is that which responds to heat-treatment on a basis to afford a glass-hard surface, supported by an elastic core. The shell is of aluminum, has a symmetrical exterior and is oil-tight.

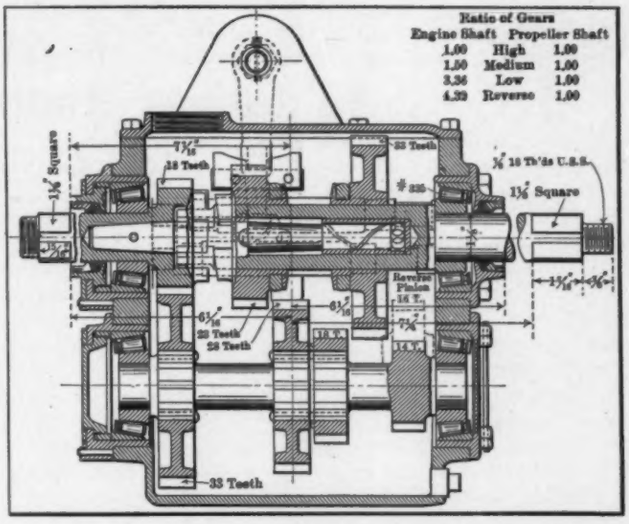


Fig. 3—Sectional drawing, showing transmission details

Referring to Fig. 4 of the front axle, which is of the I-section drop-forged in one piece from a suitable grade of steel, it will be observed that the knuckle has a long bearing, a through pin with a locking nut on the under side, and a grease cup is placed at the top by means of which the long pin bearing is maintaine din a profuse state of lubrication. The hub is sufficiently long to fix the centers between the ball bearings used so great that wobbling of the front wheels is prevented, and this desirable condition is further assured, due to the length of the steering knuckle arms, and the fact that the motion is straight line. While the subject of steering is up it will be apropose to examine the details of the steering gear as shown in Fig. 5, in which the spark and throttle to levers above the large diameter steering wheel, noting the excellence of mechanical detail and the care with which the work is executed.

CARS AS OFFERED FOR 1911

Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
	Type	Speeds	Location	Drive				Crankshaft	Transm'n	Axle		Front	Rear
Cone....	Selecti'e.	3	S. Fr'me	Shaft...	125	56	P. Steel..	3 Plain.	Roller..	Line....	2700	36x4	36x4
Cone....	Selecti'e.	3	S. Fr'me	Shaft...	125	56	P. Steel..	3 Plain.	Roller..	Line....	3000	36x4	36x4
Cone....	Selecti'e.	3	S. Fr'me	Shaft...	125	56	P. Steel..	3 Plain.	Roller..	Line....	3100	36x4	36x4
Cone....	Selecti'e.	3	S. Fr'me	Shaft...	122	56	P. Steel..	3 Plain.	Roller..	Line....	3000	36x4	36x4½
Cone....	Selecti'e.	3	S. Fr'me	Shaft...	116	56	P. Steel..	3 Plain.	Roller..	Line....	2900	34x4	34x4

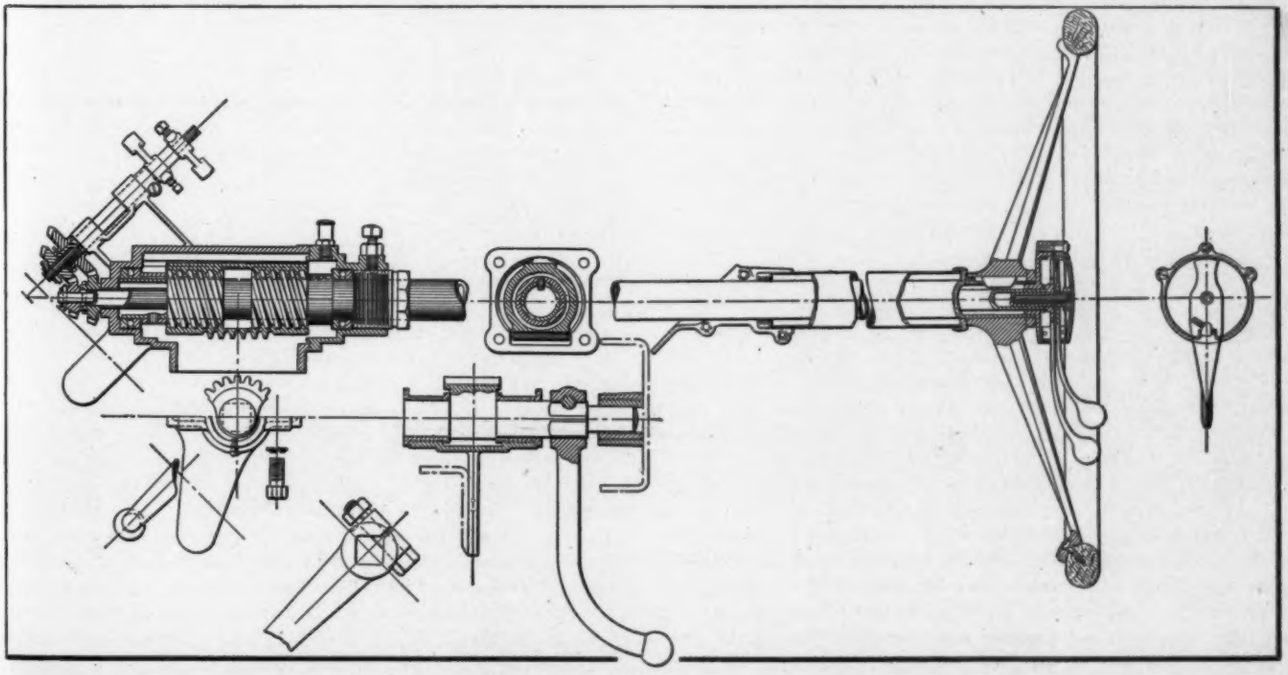


Fig. 5—Section through complete steering gear, showing double worm, hand wheel, and spark and throttle arrangement

McCord Solderless Radiator

DESCRIBING AN ELECTROLYTICALLY FORMED RADIATOR PATENTED BY "SOCIETE DES RADIATEURS ET REFRIGERATEURS"

ATTRACTED by the nice theory which underlies the construction of the radiator as patented by the "Societe des Radiateurs et Refrigerateurs of St. Ouen, France," and manufactured abroad by this company, remembering that this type of radiator has made its mark, it being used on such cars as Clement-Bayard, DeDion-Bouton, and Delaunay-Belleville, the McCord Manufacturing Company of Detroit, Mich., acquired the American rights to the patents of this system, and it is now manufacturing this type of radiator along the same lines as mark the products of the French firm, producing identical results, so that a description of this product in general will be precise for the McCord make as well as for the parent company. Fig. 1 shows one of the radiators as produced in the McCord plant, and before passing on to a description of the process of manufacture attention is called to the high finish, excellence of general appearance, and the substantial nature of the details involved.

Referring to Fig. 2 which is a section of a radiator of this type, mutilated to show the cells, and to bring out the waterway W1, it will be observed that the thicknesses of the walls are just enough to afford stability, and the ratio of the thickness of the sheet of water as compared with the body of air that sweeps through the air cells is so regulated that a balance is obtained between the specific heat of air on the one hand, and the specific heat of water on the other, taking into account the controlling conditions, among which will be mentioned the better conduction of water for heat than that which obtains for air. Fig. 3 presents quite another view of the structural detail of the cellular part of the radiator, and the water passage-ways W1 are here brought into relatively bold relief, showing great uniformity of the thickness that obtains for the sheet of water, although in tearing the radiator apart the metal was somewhat damaged in the process, and to this extent allowance will have to be made for some variation in the apparent thickness of the water space. The process utilized in the manufacture of the cellular set being electrolytic, there are no joints to be solered at any point, and the passage-ways for water are entirely free and uniform with no chance at all of having portions of the passage-ways stopped up by accumulations of solder or other debris. The only point at which soldering is done is where the cellular set is inserted into the shell, resulting in the seams S1 and S2. These seams are riveted at A1, etc., around the whole distance after the meal is tinned over, so that the process of soldering is a mere matter of heating the metal to the melting point of solder when the tinned surfaces adhere to each other, but there is no excess of solder to run and clog up the waterspace.

Referring to Fig. 4, it will be observed that the water pipe M1 sleeves over the water pipe N1, and a joint is formed at the point F1 to afford mechanical strength. The water enters in the direction of the arrow, passes into the distributing pipe as shown, and is distributed out through holes H1 on the underside of this pipe, there being a sufficient number of these holes to deliver the total supply of water without undue friction, but the area of the holes as combined is just enough below the area of the pipe to cause the water to spray, and as it sprays out of the holes. It is delivered uniformly over the whole top of the cellular set, thus inducing a condition of uniformity of the cooling process that bespeaks efficiency on an accentuated basis, due to the elimination of cold zones in the body of the radiator. This illustration has the further value of showing how the radiator is put together with a double seam at the joint K1 and an overlap at the joint K2; the front joint K1 is so made as to avoid the necessity of riveting, but the joint K2 at the back, and its mate K3 below, are riveted R1 and R2 as well as being sweated and soldered. This view presents additional evidence of the uniformity of the water space, and it shows, in some measure, the strength of the metal obtained by the electrolytic process, the evidence of strength being in the tearing of the metal during the process of sectioning the radiator for the purpose of presenting it here.

In the manufacture of this radiator a pattern is first turned out, and from this pattern a casting is poured, using a lead composition for the same. The lead casting is subjected to a cleaning process such as will brighten the surfaces and permit of utilizing the electrolytic process which follows. In the electrolytic process, copper is deposited over the lead casting until the entire surface of the lead is covered with a homogeneous coat of copper to a sufficient depth to make a series of stout walls forming the cells of the radiator as shown in Fig. 2. After the copper is coated over the lead to the required depth, the electrolytic process is stopped off and the unit in this state is transferred to a heating bath which is maintained at the temperature of melting lead, and since this temperature is below the temperature of melting point of copper the lead casting is reduced to the molten state and the lead is thus gotten rid of, leaving the copper in the form as shown in Fig. 2. There are a series of nice ramifications, and to some extent, trade secrets, that have been worked out during the evolution of this type of radiator, but the result in practice is entirely commercial, and the radiators so made are found to be not only uniform in construction, but entirely free from the annoying leaks that abound when joints are poorly soldered; moreover, the surfaces are highly efficient because the wall thicknesses are uniform, and there are no accumulations of solder to impede the flow of water or stop up the passageways. These radiators have been made for some time in France and are in common use there, and the McCord Manufacturing Company expects that this latest move on its part marks a new era in radiator work in this country.

A Word to Car Owners

Owners of automobiles can save themselves money and annoyance by providing their men with a few extra tools that are not usually found in the ordinary kit supplied with the car; they will facilitate the man's work and be an incentive for him to better look after the small troubles that cars are prone to.

A man who comes home after a long day's work late at night, having been driving from early morning, has little inclination to start work on the car and it cannot be expected of him. What time has he for such things as valve grinding? The act of valve grinding takes a comparatively short time compared with the taking out of some types of valve springs. Men do not consider that they are paid to make tools for the car as well as drive it, although some men take a delight in inventing special tools for their cars, and such men should be encouraged. A simple tool would greatly facilitat the removal of valve springs and he man would then have time to grind say one or two a day as they wanted it. This can be made with a piece of steel rod by bending it at ont end to enter the valve plug after same has been removed so that it touches the valve head. Two elbow bends can then be made in the rod so that it follows the shape of the exterior of the cylinder casting dropping perpendicularly to just above the height of the valve cotter; here a hook is made to act as a leverage for a lever with a forked end to place under the spring cup.

Fig. 1—Front view of McCord Solderless Radiator

Fig. 2—Section of radiator cut in half to show passage of water and cleanliness of construction

Fig. 3—Side view of De Dion Bouton Radiator, showing solid ends of tubes

Fig. 4—Water inlet showing continuation pipe over entire surface of plate with spray holes underneath

Two-Cycle Elmore

THE 1911 ELMORE OUTPUT INCLUDES THE PERFECTED HIGH-DUTY MOTOR, MANY MECHANICAL REFINEMENTS, AND UP-TO-DATE AUTOMOBILES

THE most important single feature of the 1911 announcement of the Elmore Manufacturing Company, of Clyde, Ohio, is that which conveys the news that, in response to an insistent public demand, a new model—No. 25—has been placed on the market. The company calls it "the small car," but it is small only when compared with the regular line—Models 46 and 36. The new car has a four-cylinder motor rated by the makers at 30 horsepower, and is made in four-passenger tonneau and two-passenger runabout types.

The regular Elmore models, which have made the two-cycle valveless engine famous, will be continued, but with not a few important changes, among which may be mentioned a change in the design of the 36-B body and the installation of the new "High Duty" type of four-cylinder motor of 50-horsepower in place of the 36-horsepower motor of 1910, with identical changes in the 46-B model, with the exception that the 1911 motor will deliver 70 horsepower.

The 1911 wheelbase lengths have been increased as follows: Model 46-B, from 120 to 124; Model 36-B, from 110 to 114. The new Model 25 has a wheelbase of 108 inches. The 46-B seats seven; 36-B five; the two No. 25 models, four and two, respectively, for touring car and roadster.

The tire equipment of the Elmore calls for 36 x 4 front and rear for the 46-B, 34 x 4 front and rear for 36-B and 32 x 3 1-2 for the new Model 25.

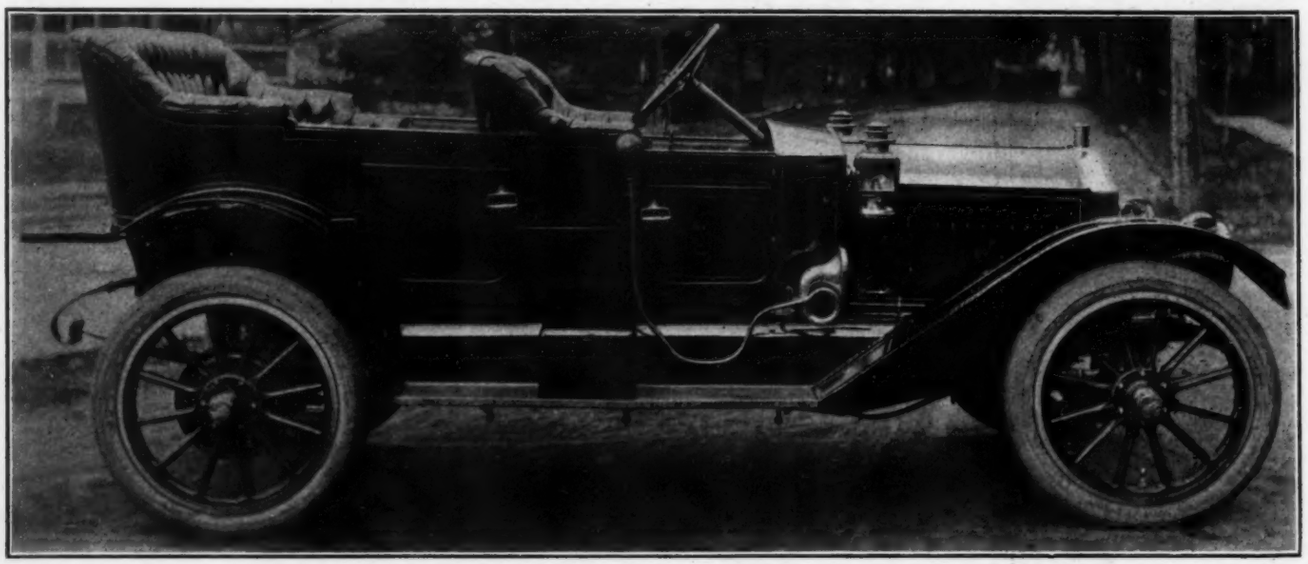
Those who have not followed Elmore practice closely will have to be told that the "high duty" motor is a wide departure from former Elmore practice. The earlier types of motors of this make were of the crankcase compression type, whereas, in the "high duty" type as it is employed in 1911 work, the initial compression is brought about by employing compression chambers and a double-diameter type of piston as here illustrated.

Exhaust Side of Model 25 High Duty Motor

An examination of the exhaust side of this motor shows the four individual cylinders C1, C2, C3 and C4 with an equal spacing between them and a symmetrical water manifold W1 with a leg connecting to a header at the top of each cylinder, utilizing holding-down bolts B1, B2 and B4 to hold the manifold in place with a flexible connection (hose) between the radiator, which is placed at the front of the fans, and the extremity of the manifold E1, which is so shaped as to serve as a secure anchorage for the hose. The remaining water manifold, W2, has a leg terminating at the low level of the water in each cylinder, and the method of bolting this manifold is somewhat different from that of the manifold W1, it being the case that the lower water manifold N1 and the exhaust manifold N2 are pressed against the flange faces on the cylinder by means of yokes Y1, Y2, Y3 and Y4. The studs that hold the yokes pass between the two manifolds and the nuts N1, N2, N3 and N4 on the studs are out in the open so that suitable pressure can be applied without difficulty. The fan F1 is driven by a belt which passes over a grooved pulley from a grooved driving pulley G1, the latter being actuated by power taken from an extension from the distributor shaft. This view of the motor shows the oil connections O1, O2 and O3 between the points of distribution of lubricating oil within the crankcase and the oil pump P1, which is sunk in the oil well between the last cylinder and the flywheel F2. The pump is of the force-feed type, and the supply of oil is taken from the sump S1, which, as will be observed, is commodious. By means of covers C5 and C6, which are readily removable, access may be had to the lower part of the crankcase, through large handholes, for purposes of cleaning.

SPECIFICATIONS FOR ELMORE

MAKES AND MODELS	Price	H. P.	BODY		MOTOR				COOLING		IGNITION		Lubrication
			Type	Seats	Cyl.	Bore	Stroke	Cyl. Cast.	Radiator	Pump	Magneto	Battery	
Elmore 25	$1200	30	R'ster	2	4	4	3½	Single.	Tubular	Syphon.	At-Kent.	Dry	Pump
Elmore 25	1250	30	Tour'g.	4	4	4	3½	Single.	Tubular	Syphon.	At-Kent.	Dry	Pump
Elmore 36 B	1750	50	Tour'g	5	4	4½	4	Single.	Tubular	Syphon.	At-Kent.	Dry	Pump
Elmore 46 B	2500	70	Tour'g.	7	44	5	5	Single.	Tubular	Spvhon.	At-Kent.	Dry	Pump



Model 46-B—Fore-door type of five-passenger touring car with straight-line effect, overhanging cowl, protective mudguards and other nice relations

Model 25—Roadster, seating two persons, with an overhanging cowl, open entrance, commodious oval gasoline tank back of the seat and a tool box on the deck at the back

CARS AS OFFERED FOR 1911

Clutch	TRANSMISSION Type	Speeds	Location	Drive	Wheelbase	Tread	Frame	BEARINGS Crank-shaft	Trans-mission	Axle	Weight	TIRES Front	Rear
Disc.....	Selecti'e.	3	Amid'p	Shaft...	108	56	P. Steel..	Plain..	Ball.....	Ball....	2000	32x3½	32x3½
Disc.....	Selecti'e.	3	Amid'p	Shaft...	108	56	P. Steel..	Plain..	Ball.....	Ball....	2200	32x3½	32x3½
Disc.....	Selecti'e.	3	Motor..	Shaft...	114	56	P. Steel..	Plain..	Ball.....	Ball....	2750	34x4	34x4
Disc.....	Selecti'e.	3	Motor..	Shaft ..	124	56	P. Steel..	Plain..	Ball.....	Ball....	3200	36x4	36x4

The view of the Model 25 motor shows the carbureter C1 with its manifold connection M1 terminating in an orifice with a flange face F1 on the top of the crank case in a position half way between the two extremities of the motor, so that the four cylinders C1, C2, C3 and C4 are in a position of vantage as respects the supply of mixture and the carbureter is permitted to work with the greatest possible facility. The lever L1 is connected to a motion which is under the control of the driver, and this lever is pressed over the end of the shaft S1. This shaft connects with the mechanism that controls the shifting of the distributor, the office of which is to distribute mixture to the respective cylinders on the two-cycle principle.

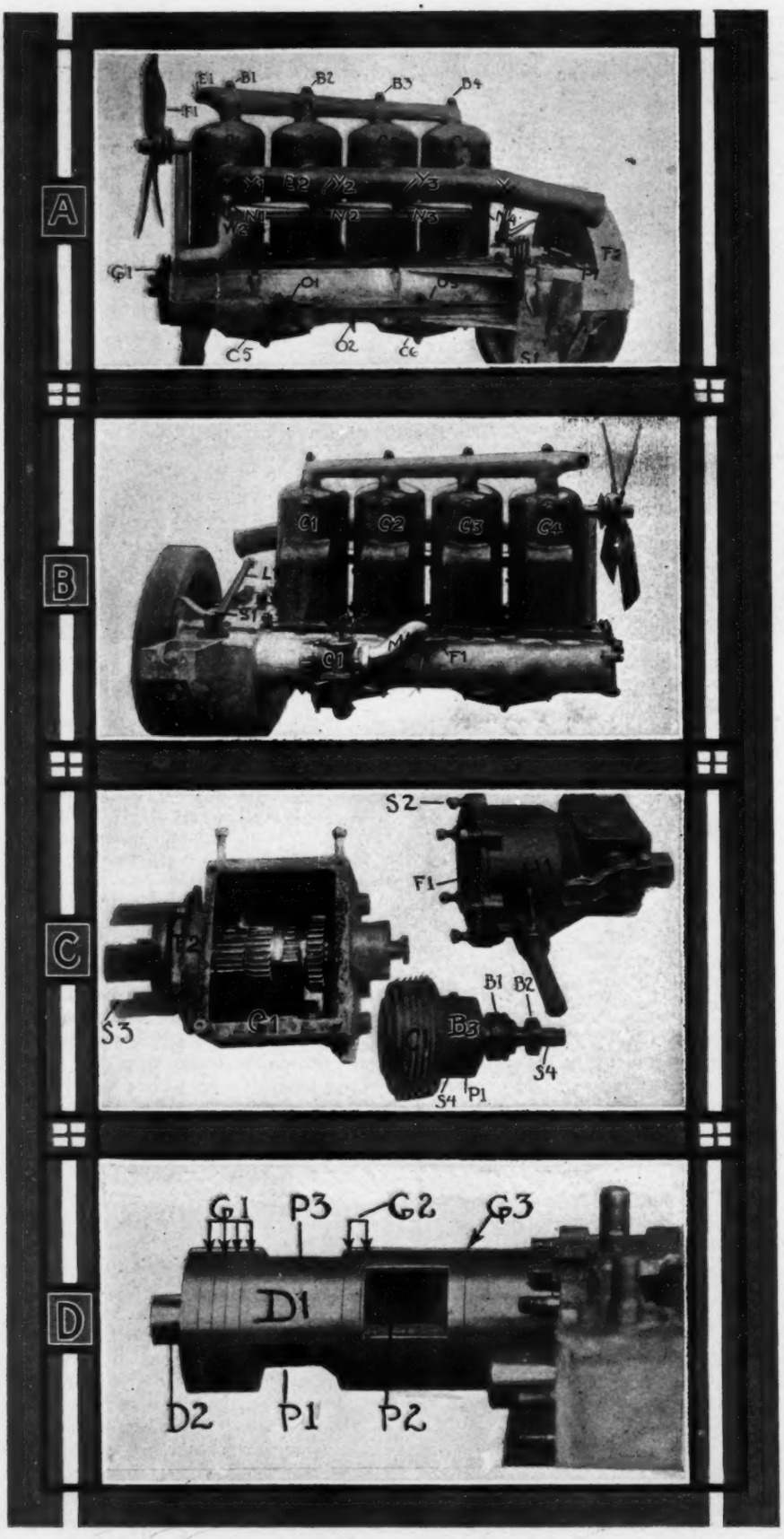
The design is cleverly worked out in practice and is quite free from parts that are likely to become deranged.

Utility of the Distributor in Model 25 High Duty Motor

Referring to Fig. D of the distributor of the Model 25 motor, it will be observed that the distributor D1 is partly withdrawn from its housing, disclosing the reduced diameter D2, which accommodates the annular type ball bearing, also the ports P1, P2 and P3. It will be understood that there are a sufficient number of these ports disposed over the length of the distributor to serve for the control of the incoming mixture on the one hand and the exhaust on the other, working on the two-cylinder principle, which gives a power stroke per revolution of the crank shaft for each cylinder of the motor. The distributor is ground to exact size and floated on the ball bearings, care being exercised not to permit the diameter of the distributor to touch the bore of its housing at any point. The clearance is regulated through the thickness of the sheet of lubricating oil that is used in maintaining proper lubrication of the motor, and it has been found in practice that the distributor is packed to absolute tightness by cutting grooves G1, G2 and G3 around the diameter of the distributor between each pair of ports, with the exception that there are four such grooves at the extremities of the distributor. It was pointed out that the distributor is connected with a shifting mechanism through the good office of which the distributor is not only moved in the axlewise direction, but it is given an angular displacement as well. The object in thus manipulating the distributor is to regulate the inflow of mixture at the will of the operator so that the compression may be increased or decreased, as the exigencies of service would seem to indicate. Because of this facility, it is possible to run under conditions of low compression, if the occasion requires, without suffering the inconvenience of "crankcase shots." It will be worth explaining that in the older forms of two-cycle motors it was not possible to utilize large transfer ports and take advantage of low conditions of compression, due to the fact that crankcase shots were invariably present as the speed was increased, the latter being the basis of decreasing compression on account of wire drawing of the mixture. Then, too, increasing speed brought on its measure of decreasing scavenging perfection, and in the long run it was deemed expedient to so design the conventional types of two-cycle motors that the transfer ports were of relatively small area, and the power delivered from motors so designed was below the best expectation. It is the fair claim of the Elmore company that the use of this distributor, combined with a method of timing it, corrects the evil tendency as noted, so that the power of the motor is very materially increased and the flexibility of its performance is also brought to a satisfactory level.

Assembled Crankcase of Model 25 High Duty Motor

A study of the crank case will show the crank shaft C1 with six main bearings M1, M2, M3, M4, M5 and M6, five of which



A—Exhaust side of Elmore engine
B—Carbureter side of Model 25 engine
C—View of gearbox and clutch forming a unit.
D—View of distributor as installed on Elmore engines

support the load as it is delivered by the four crankpins P1, P2, P3 and P4, and the sixth bearing carries the weight of the flywheel which is pressed onto the end of the shaft at E1. The distributor is in the rounded portion of the crank case R1, and is carried by annular-type ball bearings, one of which is pressed onto the end of the shaft at B1, from which the cover has been removed for purposes of explanation. The intake manifold flanges to register with the orifice O1. From the distributor mixture passes to the cylinders through the ports as shown at P5, P6, P7 and P8, but it will be observed that there are two ports at each point, and it will be enough to state that the remaining port is for the exhaust. It is important to understand that the incoming mixture is always impelled in one direction only, so that there is no inertia to overcome, but this property does add to the potential which moves the gas into the cylinders so that the supply of mixture to each cylinder per cycle is greater than would be true in the absence of this principle of design. The distributor is driven by means of the gear G1 on the crankshaft, which meshes with a mate G2 on the distributor shaft. The distributor is given axlewise motion by the level L1, and is rotated through a certain angular displacement due to the conformation of the gear G3.

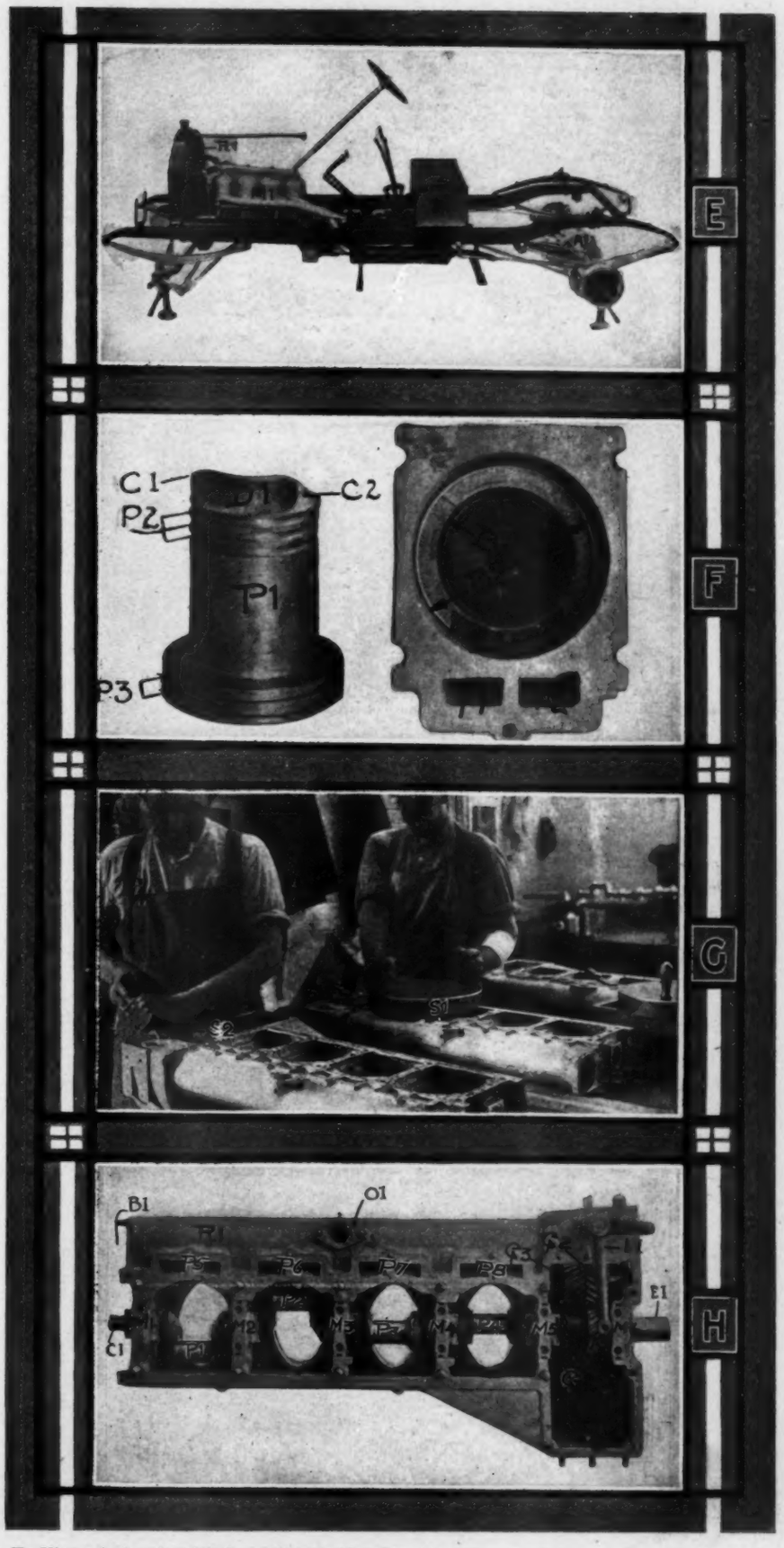
Details of Model 25 High Duty Motor

This motor, instead of utilizing crankcase compression, is so designed that the cylinders have two bores. The piston P1 has a small diameter which fits in the smaller of the two bores B1, and the enlarged extremity of the piston fits in the larger of the two bores B2. There are three packing rings P2 for the small bore and two packing rings P3 for the enlarged portion. Mixture and exhaust enter and pass out of the transfer ports T1 and T2, entering the enlarged part of the cylinder at E1. The head of the piston is provided with a deflecting plate D1, which contacts with the bore of the cylinder at C1 and C2. The four cylinders of the motor are identical as to design and in explanation of the flange it is enough to state that there are really eight single-acting cylinders, utilizing four double pistons under conditions as follows: The large diameter pistons work as air compressors, taking in mixture on the suction stroke, compressing and delivering it to the power cylinders on a 2-cycle basis. Since there is no leakage to speak of in connection with the air compressor portion of the cylinders, it is possible to definitely figure upon the supply of mixture that will enter the power cylinders; moreover, the compression in the power cylinders may be nicely regulated by fixing the compression in the air compressor division of the cylinders. As the result of a long series of experiments extending

over two years on an energetic basis, the best air compressor compression was arrived at and the proportions of the transfer ports were so fixed as to bring about harmony of the relations. It was also found by experiment, trying many successive methods, that the shape of the deflector plate D1 follows no definite law that can be discovered, but there is a shape for each size of motor that does deliver the best result, and this shape has been adopted in the Elmore type of motor. A study of the piston P1 will disclose its niceties of design; it is long, affording an adequacy of bearing surface, and the walls are designed for lightness without sacrificing strength sufficient to prevent deformations. The piston rings are of the compound type; one master ring fits in the groove in each case and it has a pair of auxiliary rings encompassing it so that tightness is the result of the combined action of the nest of rings in each case. This plan has proven to be thoroughly good in every way, and it has the further advantage of longevity, which is something worth counting in a motor.

Features of Model 36-B Axle

In order to obtain a clear idea of the details of design and construction of the semi-floating type of live rear axle of the Model 36-B car, it will be necessary to study the cross-section (page 589). Power is transmitted to the axle from the propeller shaft through the driving spindle pinion S1, thence to the pinion P1, which meshes with the bevel gear G1, the latter being flanged to the differential housing H1, which rotates with the gear. The differential system is made up of a nest of bevel gears comprising a pair of suns S2 and S3, engaging with planets P2 and P3. The jackshaft members J1 and J2 engage with the suns S1 and S2 by means of square extremities on the jackshaft members which fit snugly in broached square holes in the suns S1 and S2. As the torque of the motor is delivered through the propeller shaft and the relating members to the bevel gear G1, the housing of the differential system is given rotation in the right or left-hand direction, depending upon the position of the sliding gear lever. The torque is delivered to the planets G2 and G3 and is weighed out to the jackshafts J1 and J2 in proportion as the tractiveability of the two rear road wheels is present. If one of the road wheels offers a better tractiveability than the other, the torque of the motor is delivered to it on an increasing basis. In going around a curve the two road wheels are free to turn at their respective indicated speeds, it being the case that the outer wheel must travel a greater distance in a given time than the inner wheel. The differential system is capable of weighing out its torque to the respective wheels despite the fact that they do not rotate at the same speed. Glancing at the



E—View of chassis, showing exhaust side of motor
F—View of piston and cylinder section.
G—Surfacing of crankcases at Elmore plant
H—View of crankcase, crankshaft and gears

outer extremity of the jackshaft J1, it will be observed that it is finished with the shoulder S4, against which the inner raceway R1 presses, and the diameter of the shaft over which the ball bearing is driven is ground to a size which assures a sucking fit. Just outside of the ball bearing the shaft is again reduced to a size that makes a press fit for the thinner extremity of the hub H2, with a clearance C1 between shoulder and the final diameter of the shaft, in which the keys K1 and K2 are fitted, there being keyways to match in the hub H2. When the hub of the wheel is pressed on, the hub nut N1 is screwed on and a cotter pin C2 is then pressed through the hole, engaging one of the castellations of the hub nut. The hub cap C3 is then screwed over the enlargement of the hub; a relatively fine thread is chased in the hub cap so that when it is screwed into place and brought up firmly against its shoulder the cap will then remain as put until it is removed by the operator. The flange F1 of the hub, which is integral with the same, is of relatively large diameter so that the spokes at the miter are firmly clamped by means of the bolts B1 with the brake drum D1 serving as the inner clamping member. The brake drum is of unusual merit, due to the fact that it has a double rim, the inner portion of which R2 serves as the face for the internal expanding brake, and the outer portion R3 serves as the face for the external expanding brake, the band B2 of which being shown in section with a fire proof fabric for a facing, the latter character of material also being used for the facing of the inner brakeshoe system. The inner brakeshoe is expanded by applying torsion to the shaft S5 by pulling on the lever L1, and the outer brakeshoe is contracted by applying torsion to the shaft S6 by pulling on the lever L2. The woodwork in the wheel is of second growth hickory selected from well-seasoned stock and suitably treated in the process; bastard spokes are entirely eliminated, and care is exercised to cast out wormy and discolored wood. An examination of the tube T1 will show that it is of good diameter and fair thickness of wall, that it telescopes the relating members sufficiently to make a long snug bearing and rivets are placed at points of vantage to prevent the tube from withdrawing. The ball bearings throughout are designed to take thrust and radial load simultaneously and closures C3, C4, C5 and C6 are so placed as to prevent foreign matter from entering the bearing enclosures, while grease cups are located so that all the moving parts as well as the bearings are maintained in a state of profuse lubrication. The exterior appearance of the axle is agreeable, the design is symmetrical, the quality of the material is selected with discriminating care, heat treatment is resorted to on a basis of intelligence and the machining porcess is conducted with sufficient precision to assure that the parts will pass a rigid inspection.

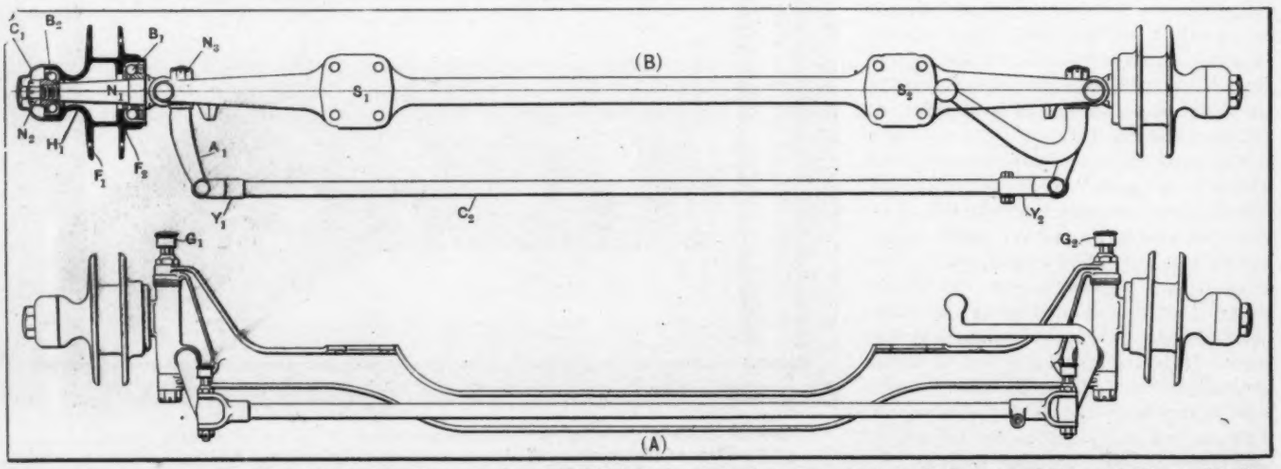
Model 36-B I-Section Front Axle and Scheme of Design

Referring to the illustration of the Model 36-B front axle, A shows the same in elevation and B is a plan. The axle is of the drop type with spring perches S1 and S2 with flanged hol for a pair of U-bolts, by means of which the springs are clampe into secure relation. Glancing at the cross-section of the hu H1, it will be observed that the fixed flange F1 is to the outside and the movable flange F2 comes to the inside. Cup and con type ball bearings B1 and B2 are used, and they are separate by a distance sufficient to support the load and prevent wobblin of the wheel. The knuckle N1 is drop-forged from a suitable grade of steel and properly treated to induce kinetic quality The inner races of the ball bearings are pressed on sufficiently to prevent them from working loose, and the hub and nut N2 is screwed up tight and is prevented from backing off by a cotter pin which passes through a hole in the end of the spindle and engages with the castellations in the nuts. The hub cap C1 matches with the hub caps on the rear wheels, and the general appearance of the axle is in keeping with the art motive of the design. The steering arms A1 are drop-forged from special steel and are prevented from turning by suitably disposed keys, and are also prevented from coming off by the nut N3, which is also locked on by means of a cotter pin. The cross rod C2 is a tube and straight threaded at its extremities to accommodate the yokes Y1 and Y2. The bearings at all points are proportioned in view of the results of experience and grease cups G1 and G2 afford a means for suitably lubricating the knuckle pin.

It is recognized that cost of maintenance is too high if the questions of lubrication are not properly cared for and that these questions of lubrication are of far more importance than is generally well appreciated.

Clutch and Transmission Combined in a Unit

From the clutch point of view there are three principal schemes of design in vogue, placing the clutch either in conjunction with the motor as a unit with the transmission gear, the latter being separate, or incorporating the clutch into the gear system and combining the latter with the rear axle. In the Model 25 Elmore system the clutch is combined with the transmission, making a unit in common for the two, but this unit is placed amidship on the chassis frame, separated from both the motor and the live rear axle. Referring to Fig. C, the transmission gear system G1 of the three speed and reverse selective type is provided with a clutch spider S1 at the front end, into which the clutch C1 is nested and the cylindrical housing H1 encloses the clutch, the flange face F1 bolting against the flange F2, being held in place by six studs S2 in the manner substantially as shown. The multiple-disc clutch has 13 plates, 6 of which engage in the slots S3, so that they are prevented from rotating, excepting with the spider S1, seven of which are splined to the shaft S4. Axlewise thrust is compensated for by the ball thrust bearing B1, and radial work is cared for by annular type ball bearings, one of which, B2, is indicated. The clutch is engaged when the block B3 is given an angular motion, due to the travel

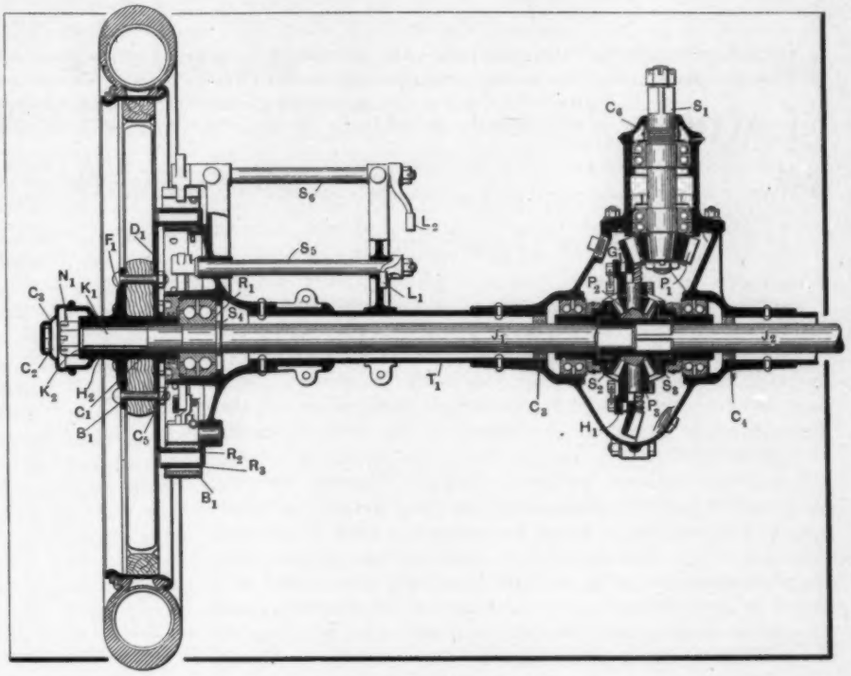


Plan and elevation of the I-section front axle as used on Model 36-B car, showing symmetry of design, carefully worked out details, and the elements of a harmonious relation to the rear axle design

of the pins P1 in the cam slots S4. The entire construction is noted for its substantial character, simplicity reigning throughout.

General Relations in Model 25 Chassis

The chassis frame is of the channel section steel, with a kick-up at the rear, thus bringing the power plant low down and making the center of gravity of the car as low as it is possible to have it so that the road performance of the car is on a high plane and the turning over speed on a curve is maximum. Referring to Fig. E the radiator R1 is placed on the chassis frame in the plane of the front axle and the motor M1 is suspended so that the flywheel is given adequate ground clearance, making the transmission a substantially straight line in the plane of the crankshaft back to the live rear axle A1 when the springs are depressed the amount due to the weight of the machinery, chassis, body and passengers. The rear springs are of the full-elliptic (scroll) type, related to the chassis frame through trunnions, utilizing double U clamping bolts, and provided with rubber bumpers, which, however, do not come into play, excepting under overload condition, traveling at very high speed and in an emergency at that, involving an abrupt change in the road level. The front springs are half-elliptic, provided with rubber bumpers, are fastened to perches with double U-bolts and are clamped down tight. The fuel tank F1 is rectangular, placed above the top of the chassis, coming under the front seat of the car, so that it is high enough to take advantage of a gravity feed to the carbureter. There is an entire absence of castings and irregularly shaped parts; the chassis presents a clean appearance at every point and care is exercised to make the fit of the relating members so close as to prevent noise and rattle without, at the same time endangering the freedom of motion of the relating parts.



Cross-section of the Model 36-B semi-floating type of live rear axle showing a bevel differential, bevel drive, ball bearings designed for radial and thrust loads, double-faced brakedrum and other appropriately designed members.

Important Variations from Four-Cycle Practice

It will be understood that the principle of the 2-cycle motor is substantially a revel in simplicity, but there are certain characteristics of this type of motor that have ever been stumbling blocks to those who, laying great stress upon absence of complication, overstep the bounds to the extent that they more or less disregarded the mechanical problems involved. Referring to Fig. G, it will illustrate the point here to be made; in this illustration the surfaces of the crankcases are worked down to a level far more perfect than will be possible by any machining process whatsoever. It may not be generally understood, but if two pieces of metal are perfectly smooth when they are brought together, they will resist being separated. This adhesive tendency is due to the fact that the perfectly surfaced parts when they are brought into contact with each other exclude the atmosphere when the atmospheric pressure, which will be on all the surfaces, excepting the surfaces of contact, will hold the two members in contact with each other, and the force of the engagement will be that due to a pressure of 14.7 pounds per square inch. The illustration shows how this process is conducted on the machine faces of the crank case in which S1 is the surfacing block, which, when it is blued over and motion is imparted to it so that it traverses the machine surfaces of the crankcase, the high spots over the machined surfaces will partake of the blue and the next operation is to use a scraper S2 in the process of removing the high spots. This operation is continued and repeated a sufficient number of times to bring about the desired perfectly straight surfaces so that the cylinders, which are given the same treatment, will make tight joints with the crankcase. The success of the Elmore type of 2-cycle motor is a legitimate dividend of the care with which the machine operations are conducted, remembering that the simplicity of the 2-cycle type of motor does not serve as a license to disregard the necessities.

There will be no change in the prices as compared with 1910. Models 46-B and 36-B will remain at $2500 and $1750 f. o. b. factory, respectively, while the new Model 25 will be listed at $1250 for the touring car and $1200 for the roadster. Elmore equipment includes lamps, horn, tools, etc., of a grade in keeping with the rest of the car. Top and windshield are extra.

Foreign Motor Car Imports and Exports

From the figures published the exportation of French cars shows an increase in value. Up to the end of August of this year the exports were $23,568,800.00, as compared to $19,274,400.00 for the same period of 1909. Great Britain heads the list as the largest consumer, the exports to that country having increased from $8,591,415.00 to $9,678,600.00. The following countries also show an increase: Germany, Belgium, Switzerland, Italy, Austria, Russia, The Argentine, Turkey and Algeria. But the number of cars shipped to Spain, United States and Brazil show a decrease. The imports also show an increase from $976,000.00 to $1,166,000.00 for the first eight months of this year over a like period of last year.

Some interesting figures concerning the motor car imports and exports of Great Britain have just been published by the Board of Trade of the British Government.

Besides the actual exports, the cars and parts that were imported and re-exported are taken into consideration, as they should be, to find out the state of the actual position of the country's business.

The imports for the month of August, 1910, shows an increase over other years of $50,000.00 and less cars were re-exported by $219, which shows a larger proportion of home purchases. The net exports of British made cars was $1,065,290.00, against net imports $259,395.00. For the eight months ending August 31, 1910, the total imports of cars and parts was $17,127,970.00, against a net exportation of British cars of $7,483,220.00, being an increase over last year's figures of $2,970,940.00.

Letters

COMMUNICATIONS FROM READERS MAINLY ALONG TECHNICAL LINES: HOW TO REMEDY LOSS OF COMPRESSSON; COASTING DOWN HILL; CONSTRUCTION OF AUTOMOBILE AXLES; STRAINS ON WHEELS

Loss of Compression

Editor THE AUTOMOBILE:

[2,379]—With reference to your answer to Question No. 237 in last week's issue I have a motor fitted with four piston rings to each cylinder, these constantly move around in the manner you describe. Cannot something be done with the present rings to keep them in place without buying 16 new rings and having them specially cut in the manner you suggest? W. H. T.

Trenton, N. J.

Yes, another method sometimes employed is to pin the piston as shown. The positions as marked in the accompanying sketch, Fig. 1, you will find a great improvement in the compression. The iron from which pistons are made is very brittle, consequently tapping should be very gentle and the pins should be inserted so that there is no fear of them coming out either inside the piston or out against the cylinder walls. One pin dislodging itself is sufficient to spoil an engine.

Worn Valve Stems and Guides

Editor THE AUTOMOBILE:

[2,380]—I have a motor four years old and the guides and valves are badly worn. Can this wear be remedied without rebushing? T. R. T.

Allentown, Pa.

After considerable use the hammering on the base of the stem of the valve causes wear and the distance between the lifter and the valve will be too great and prevent the valve opening to its full extent. In older models of gasoline motors where adjustable lifters are not employed, two methods may be used to overcome this fault without purchasing new valves or lifters. Small caps should be made to fit under the feet of the valves and afterwards case-hardened. Amount of clearance between valve and lifter should not be more than the thickness of a visiting card.

Another way is to take the valve to a competent man and let him heat the stem near the base and draw it out slightly. Great care, however, should be taken that it is perfectly straight afterward, otherwise it will not pass through the guide.

When the valve guide is badly worn the following method may be resorted to in order to temporarily overcome this. A small collar should be made and drilled to a good working fit for the valve stem, as the sketch shows (Fig. 3). In the case where the guide is cast with the cylinder it requires great care and the use of special tools and jigs not everywhere obtainable to rebush, otherwise the holes would be almost certain to be out of alignment with the valve seating. A good permanent job can, however, be made in the following manner when special tools are not obtainable: Turn the old guide below the line C-D away, also above A-B. A guide similar to E and E1 in Fig. 2 should be made from phosphor bronze with a slightly tapered head. The cylinder should be bored to accommodate this, allowing for an infinitesimal amount of side play. The conical fit will allow the valve to find a perfect seating as the spring's action will keep the new part in position.

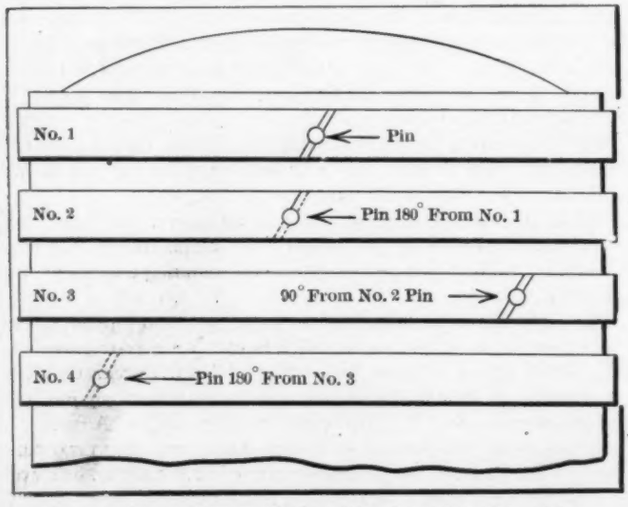


Fig. 1—Illustrating methods of keeping pistons in place

Castor Oil Will Silence Noisy Gears

Editor THE AUTOMOBILE:

[2,381]—The gears of my ——— car have become noisy lately yet seem to be in good mechanical order. Can you suggest anything to quiet them? A SUBSCRIBER.

St. Joseph, Mo.

Provided the bearings are all tight and filled with oil-retaining discs of felt castor oil should overcome the noise. Under no circumstances use it for the engine, but in the gear box and rear construction it will work wonders if you can keep it in.

Piston Clearance in Cylinders

Editor THE AUTOMOBILE:

[2,382]—Will you kindly explain through your columns if your answer to letter No. 2,361 relative to piston clearance is correct? In this answer, you state that the clearance at the top of piston should be about half as great as on the bottom. This is exactly opposite from what we have always understood to be common practice, that is to say, the top of the piston being hottest should require the greater clearance. This subject is a very interesting one and the writer would be glad to read your explanation.

Quincy, Mass. FRANK T. CABLE.

The reason for the larger clearance of the piston and the cylinder at the top than at the bottom, is according to the figures taken not being as small as they might be, but nevertheless such that work well in ordinary touring cars that do not need excessive compression, to prevent excesses of oil passing by the piston. The amount of expansion of cast iron from which pistons are made is 1:909 at 212 degrees Fahr., does not perceptibly effect the amount of clearance, but by having the top larger than the bottom the lubricant is sucked up in the form of a cone with the apex towards the top and less likely to pass than if the apex was the other way as it would be if the bottom of the piston was larger than the top.

Freewheeling Down Hills

Editor THE AUTOMOBILE:

[2,383]—I have arranged a magneto cut-out on a high-grade, six-cylinder touring car; the engine has a bore of 4 1-2 inches and a stroke of 4 3-4 inches. I make a practice of stopping the engine by short circuiting the magneto at the top of long hills, and coasting down with the transmission in direct drive and clutch disengaged. Near the bottom of the hill I crank the engine with spark retarded and throttle nearly closed, by gradually engaging the clutch. Is this practice hard on the car? R. R.

Park Row, N. Y.

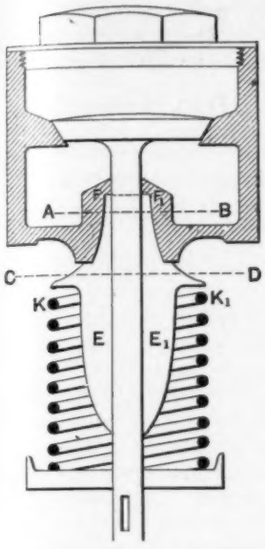


Fig. 2—Method of repairing worn valve stems.

The practice of cutting the engine out and coasting down long grades has a beneficial effect on the car because the engine can then be used as a brake as well as receiving a cooling through the inrush of air through the radiator while no heat is being generated. It is preferable, however, to start the engine with the spark half advanced instead of fully retarded. As long as the engagement is effected gradually no harm can be done to the car. Great economy in gasoline will be noticed if this method of driving is carried out. On long hills you should alternate the use of the foot brake with the hand brake and not use one all the time; far too many people rely on the foot brake to do all the work of stopping and when they require the side brake in a case of emergency they forget they have such a thing on their car.

The Construction of Automobile Axles

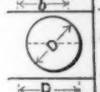
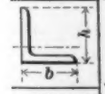
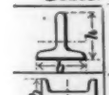
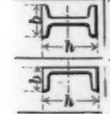
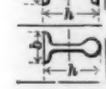
Editor THE AUTOMOBILE:

(2,384)—What are the different considerations to be taken into account in the construction of an axle? ENGINEER.

Williamsport, Pa.

Elements of usual sections:

A = area of section. b = breadth. h = depth. D = diameter.

Shape of Section.		Moment of Inertia	Moment of Resistance	Square of Least Radius of Gyration.	Least Radius of Gyration
	Solid Rectangle.	$\frac{bh^{3}*}{12}$	$\frac{bh^{2}*}{6}$	$\frac{\text{Least }^{2}*\text{ (Side)}}{12}$	$\frac{\text{Least side}*}{3.46}$
	Hollow Rectangle.	$\frac{bh^{3}-b_1h_1^{3}*}{12}$	$\frac{bh^{2}-b_1h_1^{2}*}{6h}$	$\frac{h^{2}+h_1^{2}*}{12}$	$\frac{h+h^{1}}{4.89}$
	Solid Circle.	$\frac{AD^{2}*}{16}$	$\frac{AD*}{8}$	$\frac{D^{2}*}{16}$	$\frac{D*}{4}$
	Hollow Circle A, area of large section; a, area of small section.	$\frac{AD^{2}-ad^{2}}{16}$	$\frac{AD^{2}-ad^{2}}{8D}$	$\frac{D^{2}+d^{2}*}{16}$	$\frac{D+d}{5.64}$
	Solid Triangle.	$\frac{bh^{3}}{36}$	$\frac{bh^{2}}{24}$	The least of the two: $\frac{h^{2}}{18}$ or $\frac{b^{2}}{24}$	The least of the two: $\frac{h}{4.24}$ or $\frac{b}{4.9}$
	Even Angle.	$\frac{Ah^{2}}{10.2}$	$\frac{Ah}{7.2}$	$\frac{b^{2}}{25}$	$\frac{b}{5}$
	Uneven Angle	$\frac{Ah^{2}}{9.5}$	$\frac{Ah}{6.5}$	$\frac{(hb)^{2}}{13(h^{2}+b^{2})}$	$\frac{hb}{2.6(h+b)}$
	Even Cross.	$\frac{Ah^{2}}{19}$	$\frac{Ah}{9.5}$	$\frac{h^{2}}{22.5}$	$\frac{h}{4.74}$
	Even Tee.	$\frac{Ah^{2}}{11.1}$	$\frac{Ah}{8}$	$\frac{b^{2}}{22.5}$	$\frac{b}{4.74}$
	I-Beam.	$\frac{Ah^{2}}{6.66}$	$\frac{Ah}{3.2}$	$\frac{b^{2}}{21}$	$\frac{b}{4.58}$
	Channel.	$\frac{Ah^{2}}{7.34}$	$\frac{Ah}{3.67}$	$\frac{b^{2}}{12.5}$	$\frac{b}{3.54}$
	Deck Beam.	$\frac{Ah^{2}}{6.9}$	$\frac{Ah}{4}$	$\frac{b^{2}}{36.5}$	$\frac{b}{6}$

The usual form of axle used in the construction of automobiles of the present day is the I-section stamped from the solid bar of steel of adequate strength. The construction of the axle is only one factor that has to be taken into consideration; the other is the quality of the steel employed. In order to determine the dimensions of the section we must first of all take a weight that it has to carry, and as all cars vary in this particular, suppose that this is represented by the letter W. The strains an axle has to bear are the superweight, torsion strain rounding curves and the shocks occasioned by impact with obstacles on the road surface.

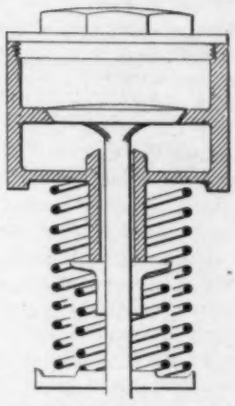


Fig. 3—Method of temporary repair for worn valve guides

The form the axle is usually stamped is shown in Fig. 4, the boss at the point F being particularly adaptable for the shape of the mould; to determine the sizes of A B and C the angle G and the width of D and E it is necessary to resort to the known formulæ on the matter.

First to find the safe load in pounds that the axle can support the following table, compiled by the Pencoyd Iron Works, gives the following, where the load is distributed:

Where L = length in feet between supports.
A = sectional area of beam in square inches.
D = depth of beam in inches.
a = interior area in square inches.
d = interior depth in inches.
w = working load in net tons.

1. $\frac{1{,}880\ Ad}{L}$ 2. $\frac{1{,}880\ (AD-ad)}{L}$ 3. $\frac{1{,}400\ AD}{L}$

4. $\frac{1{,}400\ (AD-ad)}{L}$ 6 and 9. $\frac{1{,}860\ AD}{L}$ 10. $\frac{3{,}560\ AD}{L}$

11. $\frac{3{,}200\ AD}{L}$ 12. $\frac{2{,}900\ AD}{L}$

based on fiber strains of 16,800 pounds for steel (see table).

After the weight the axle has to carry has been determined the modulus of the section can be found from

$$\frac{D \times (A+B+C)^{3} - (D-E) \times B^{3}}{6\,(A+B+C).}$$

The modulus of the section or the value of the section for purposes of calculation of the moment of resistance multiplied by the strength in pounds per square inch in tension with elastic limit of the material of which the axle is made will give the bending moment or corresponding moment of resistance.

Supposing the axle to have a superweight of 2,000 pounds and from the modulus of the section (which are usually supplied

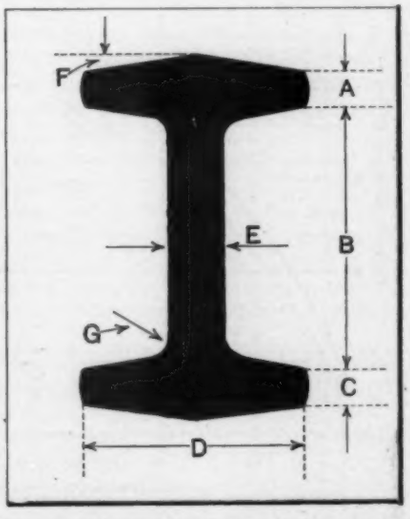


Fig. 4—Section of I-type axle; the arched tops are used to suit the moulds in stamping

by the makers of the steels) the dimensions necessary for the axle to carry this weight can be found. But besides the superweight there is to be taken into consideration the force exerted by the weight behind the axle when the wheels come in contact with obstructions on the road.

If the weight behind the axle is say 2,500 pounds, when it strikes the obstacle the bending arm between the spring clips and the center of the wheel will be subjected to side torsion strains which will effect the moment of resistance in proportion to the speed at which the car is traveling.

The height of the center of gravity of the car in respect to the height of the axle will also have to be taken into consideration, as the higher the center of gravity is placed so is the forward thrust changed to a twisting strain.

To arrive at this calculation the axle is considered equivalent to a beam fixed at one end and loaded at the other, or the section should equal the length of the bending arm multiplied by the load on the axle multiplied by the pressure due to extreme impact in pounds per square inch divided by the strength in pounds per square inch in tension with the electric limit of the material of the axle.

Outside Wheel Subject to Greatest Strain

Editor THE AUTOMOBILE:

[2,385]—Have heard the matter discussed as to whether the strain is on the outside or inside wheels of an automobile when turning a curve, and the matter is not settled in my mind. Can you tell me upon which wheels the strain really is in turning a curve, say around a one-eighth mile circular track?

Meadville, Pa. J. H. PARDEE.

The greater strain is undoubtedly on the outside wheels, which ever direction the car is going. The reason for this is that centrifugal force tends to throw all the weight and strain upon the outmost point of contact which is the tires, and it is for this reason the outer tires always wear out in races on circular tracks quicker than the near side ones. The off-side front wheel receives the greater part of the strain, as it is on this wheel that the strain caused by the centrifugal force added to the forward push is impinged. To clearly show this one only has to take the example of a side slip on a greasy road; if the brake is applied in rounding a curve the slip throws the car outward, forcing the back round and making the outside front wheel the center of the arc of the circle described.

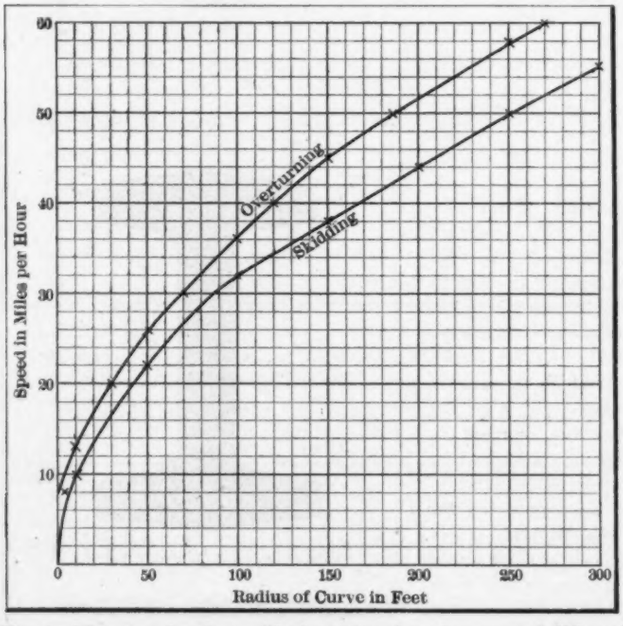


Fig. 5—Diagram showing critical speeds of road curves of different radii

Taking the weight of the car and passengers as 2,240 pounds, the height of the center of gravity 2 feet 6 inches, the wheel track of 4 feet 6 inches and 0.66 pounds coefficient friction or adhesion of the weight on the tires,

$$F = \frac{2{,}240 \times 2.25}{2.25} \text{ . } 2{,}016 \text{ pounds,}$$

2.25 being half the wheel gauge of 4.6, therefore, 2,016 pounds is the amount of centrifugal force necessary with the dimension given to commence overturning.

On a curve of a given radius, *e. g.*, 100-feet, radius of one-eighth mile circular track = 105 feet

$$\text{we have } \frac{g = \sqrt{2{,}016\,gr}}{w} \div 1.46.$$

R = radius of curve in feet gravity or 9 = 32.2 and w = 2,240 weight of car.

$$V = \frac{\sqrt{2{,}016 \times 32.2 \times 100}}{2{,}240} \div 146 = 36.69 \text{ miles per hour.}$$

The speeds are shown in curve in Fig. 5.

Magnetos Don't Break Crankshafts

Editor THE AUTOMOBILE:

[2,386]—Will you kindly answer the following for me: Is it possible to break the crankshaft of a four-cylinder motor with a make-and-break spark if the timing is not set as it should be set, the cylinder having a bore of 3 3-4 inches, with a 1 1-4 inch diameter crankshaft, or if two cylinders were timed right and the third cylinder timed so it fired far in advance, would this cause the crankshaft to break? INFORMATION.

Newark, N. J.

Chauffeurs' Lot in Honolulu

Editor THE AUTOMOBILE:

[2,387]—I have been reading THE AUTOMOBILE a long time and take the liberty of asking you what you know of the automobile proposition in Honolulu in the Hawaiian Island.

I have heard that drivers get good pay there (that is, American drivers).

I have had over seven years' experience, three and one-half years in the East and a little over four years in the West.

Canon City, Colo. BARRETT E. SIBLEY.

With reference to your inquiries respecting the automobile proposition in Honolulu, we have pleasure in informing you that place is growing with the advancement of the sugar-growing industry. The officials of all these concerns own automobiles; besides these gentlemen most of the government officials run cars as well as the better-class natives. There is a motor carnival held in Honolulu each year as well as a battle of flowers. Most of the cars are of American manufacture, and there are probably fifty that take part.

The cost of living is high, and it is not thought advisable to go out on speculation unless money is no object, and it is infinitely better to obtain some sort of employment before arriving.

Automobile driving is about the hardest work that is done by whites, all manual labor being done by natives.

Why Is There Such a Great Difference?

Editor THE AUTOMOBILE:

[2,388]—I took a demonstration in an automobile; it was satisfactory, and I then purchased one of this make and model, but now that I have it I find that it does not ride nearly as well as the demonstrating car. The tires are of the same diameter, but I notice that the tires on my car are 3 1-2 inches in section, whereas the tires on the demonstrating car were 4 1-2 inches in section. Would this make any great difference? ED. C. ATKINSON.

Chicago, Ill.

The difference will be in proportion to the square of the section.

Questions That Arise

CONCERNING TEMPORARY REPAIRS TO A LEAKY GASOLINE TANK; CAUSE OF EXCESSIVE WEAR ON FRONT TIRES; HOW TO COUNTERACT SIDE-SLIP; HORSEPOWER FORMULAE, ETC.

[239]—What is the best way to get home if the gasoline tank leaks?

A flexible metal pipe about six feet long is a very useful accessory to always carry on the car, to replace a defective or broken gasoline or oil pipe. A case came before our notice some time ago where the small pipe conveying the gasoline inside the tank (under pressure) from the bottom to the connection at the top became unsoldered, making it impossible for the car to proceed, although the tank was full.

To take the tank off, walk several miles with it and wait while the fumes evaporated would have taken too long; so some method had to be devised to temporarily overcome the trouble.

The only means possible was to fix up a gravity siphon. The only piping on the car was the copper tubing for the acetylene headlights, and this was clogged with a high explosive composition caused by the action of the acetylene on copper. The driver's companion held an emergency can of gasoline in his arms and the pipe was introduced into the gasoline tank; then the regular gasoline feed pipe was cut by a file (the only cutting tool on the car), near the carbureter and a joint was made between the emergency and regular pipes with the rubber connections from the headlamps.

Before this last operation was effected the driver placed the end of the pipe out of the tank in his mouth and sucked through it, causing the siphon to work, coupled up and ran for 70 miles.

When coming to solder the pipe in the tank afterwards he learned to his cost the necessity of leaving a tank that has had gasoline in it for a very long time without putting a flame to it. The tank was left overnight with both connections undone (top and bottom).

Air was pumped through the tank next morning for two hours with a tire pump and when a flame was then put to the tank a terrific explosion took place.

[240]—What is the cause of excessive wear on front tires?

It is not necessary for the tires to be bad or faulty for abnormal wear to show under 1,000 miles. It is probably due to the front wheels not being in alignment with the rear wheels; or it may be caused through some defect or backlash in the steering preventing the wheels from falling to the proper angle which they should when turning a corner.

[241]—How can a punctured float be repaired on the road without solder?

As a temporary method of repairing a punctured carbureter float, the use of sealing wax may be cited. In cases where the float has flooded, through the perforation of the solder, the first thing to be done is to bore a small hole in the float, in order to let out the accumulated liquid, and the surface should be carefully cleaned round the puncture. A piece of sealing wax should then be obtained, and a few drops melted over the hole, and pressed well down, in order to fill it up. It will then be found that the float is again good for any number of miles. One advantage of this method is that the wax adds little weight to the float. It is advisable to moisten whatever article is used for pressing in the melted wax, in order to prevent its sticking.

[242]—What is the weight of cast-iron compared with that of deal patterns?

Multiply the weight of the pattern by 17.

[243]—Why does the spark plug in the back cylinder of a four-cylinder motor become sooty and covered with oil while the other three remain clean and fire perfectly?

The cause of this is either the oil feed to the back end of the base chamber is allowed to run too fast, or the baffle plate dividing the front pair of bases from the back pair is not high enough to prevent the oil from flowing back while the car is going up hill. It would be thought, however, that in going down hill the return flow would equalize itself; the reason it does not is that going down hill the motor is not usually working fast, whereas going up hill the speed of the motor is increased on account of driving on a lower gear.

To overcome this fault empty the bases of all oil and pour in fresh to an equal level and adjust the lubricator so that the front base feeds faster than the rear. If this does not stop the backward flow it is necessary to fit higher baffle plates. The oil in the base chamber of a gasoline motor that depends upon splash lubrication becomes more like a vapor than a liquid after the motor has been running for a short time, and the faster the speed of the engine the smaller the particles become.

[244]—How is the action of a side slip to be counteracted?

To take it for granted that a side slip is inevitable under certain conditions is a very poor excuse after an accident has happened. In the first place most side slips are due to carelessness and miscalculation; of course a driver of an automobile cannot be held responsible for the idiosyncrasies of other users of the highways, and what would be considered a safe speed on a clean road would be highly dangerous if other traffic were about.

Supposing the driver of another vehicle immediately ahead of you pulls out without warning across your path while you are traveling at 12 miles per hour on a greasy road, you have no alternative but to apply your brakes or smash into him. This operation, however, is often the cause of a side slip, but if carried out in the following manner the slip will be greatly minimized:

The moment you perceive the vehicle in front of you begins to deviate apply a hard pressure on your brake, temporarily locking your back wheels and at the same time turning your steering wheels in the direction the obstruction proposes to go. (For this illustration it is to be understood that you are following the correct rules of the road as regards passing and that there is no obstacle coming in the opposite direction.) The harsh application of the brake should be only momentary and the steering should then be thrown over to the opposite side to counteract the effect of the first brake effect. The brake should be applied till the momentum of the car is brought to the required speed, but in jerks and not by continual pressure. The movements of the steering wheel must be decisive, because slow movements or greasy roads are liable to cause a front-end skid, which is infinitely worse than a rear skid; the car becomes as uncontrollable as a boat without a rudder. The action of turning the front wheels quickly squeegees the moisture from under the tire and gives it a temporary purchase which is in most cases sufficient to alter the course of the motion.

Applying the brake in jerks is certainly not good for the car but infinitely better than a collision.

If you find yourself sliding toward the curb, so that the rear will strike first, turn your steering wheels toward the curb also, as perhaps by the time you reach it the front wheels will have changed the motion of the slip and allow you to graze it with a forward slide instead of a direct blow that often causes a broken wheel.

[245]—What are the formulæ for figuring horsepower used by the various automobile associations?

A.L.A.M. $D^2 \times n \div 2.5$.

Royal Auto Club of Great Britain. $(D+L)^2 \times n \div 9.92$.

D = Diameter of cylinder in inches.

L = Stroke of piston in inches.

R = Revolution per minute of crankshaft.

n = Number of cylinders.

Dont's

INJUNCTIONS COVERING A VARIETY OF SUBJECTS BEARING UPON THE AUTOMOBILE FROM THE SEVERAL POINTS OF VIEW AND SAGE ADVICE TO THE MAN WHO WOULD ENTER WHERE ANGELS FEAR TO TREAD

Don't come back from the races and bore your neighbors about your hair-breadth escapes; a miss is as good as a mile.

Don't catch the racing fever so badly that you will have to apologize to every policeman that you meet on the roadside; your brand of enthusiasm may not be as catching as the smallpox.

Don't forget that racing cars frequently wear out a few thousand dollars worth of tires in a single day; speed is what does it.

Don't overlook the fact that these large tire bills are generated by this high speed, despite the fact that the road is especially prepared for the purpose; even less speed on a bad road will have substantially the same effect.

Don't let the claws out from under the velvet. If you do persist in abusing your tires and then ask the maker to replace them on the ground that they were defective, just be nice when he tells you that he knows better.

Don't display the cloven hoof to the fellow who walks; if you meet him on the road it will cost you nothing to slow down to a respectable pace, and he will think that you are a white man.

Don't stop at a small garage by the wayside, have the radiator of your car filled with water, borrow tools with which to make repairs and go away without showing a little appreciation.

Don't hypnotize yourself into believing that a fore-door type of car will be too warm for Summer time; it certainly will be comfortable in the Winter time, and when the dog days arrive you can throw the fore-door away if you want to.

Don't abandon a top because it is travel-stained; it may be coaxed into first-rate shape by the sparse application of a little good leather dressing, but it will be a grave mistake to apply this dressing. copiously. A little dressing and a little work, that's all.

Don't put your automobile out of commission and figure upon using the tires as a savings bank for mud; they should be cleaned and stored in a well-ventilated, dark place. Castile soap and tepid water will make a good solution with which to clean them.

Don't overlook the fact that the lining of an automobile top will present a better appearance than otherwise if it is occasionally brushed. A whisk broom is a satisfactory instrument.

Don't delay polishing the brass work with the understanding that you will do a good job when you get at it; there will be an entire absence of good brass work when you start on a delayed basis.

Don't give the brass work a "lick and a promise": the lick is all right, but the verdigris that forms continuously will get the best of your promise.

Don't lay too much stress upon "selling points" that may not exist in the car you are talking about; for all you can tell, the "prospect" might be endowed with sense enough to look into the matter.

Don't sandpaper the lacquer off of your new lamps; it is transparent coating that will prevent the lamps from tarnishing for a long time. When it becomes shabby, it will be time enough to dissolve the lacquer by applying alcohol.

Don't acquire the hallucination that there is a material defect at some point in the car you are paid to dispose, and then work the salesman's trick of bragging about it on the ground that it is a particularly new and brilliant idea; fools rarely have money enough to buy an automobile.

Don't put protectors over the lamps to hide the dirt that you failed to take off; for all you know a rainstorm might come along and wash them for you.

Don't be the character of salesman who jabbers about the kind of steel that is used in the car you are trying to unload; if you know anything about the material used, it will be time enough to say so.

Don't work overtime trying to carry conviction; you don't have to; just tell the truth.

Don't forget that a prospective really wants to know how bad the car is, not how good; tell him.

Don't make a $500 automobile out to be a $5,000 affair; if a prospective comes along with $500, why not give him what he wants?

Don't talk to the prospective while making a demonstration; he may not care to listen to your version of the last scandal; what he wants to know is, how will the automobile perform? Show him.

Don't do "stunts" with the car you are demonstrating; you take an undue chance with your prospect; the customer is not entitled to a car that will do any more than perform well.

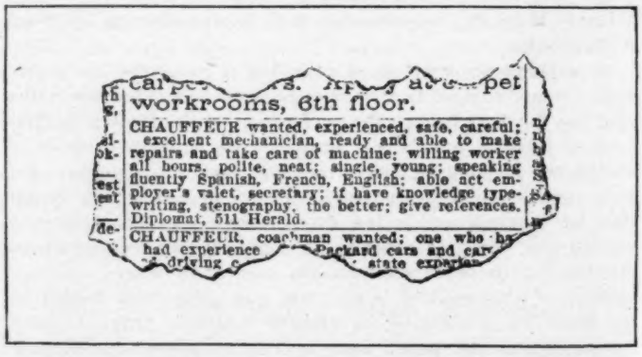
Don't exaggerate the speed possibilities of the car; it will be a pleasant diversion to find a demonstrator who will not lie about the speed. Sensible customers much prefer to merely realize that the performance is satisfactory.

Don't squander your time lolling around in front of a garage waiting for a call; it will be more profitable all around if you will put in your idle moments lubracting the bearings of the automobile.

Don't own a garage that is not provided with a room for the accommodation of the chauffeurs; a gang of them hanging around the front of the building will drive your best business away.

Don't overlook the fact that ladies do not enjoy stopping at a garage that has a gang of loafers standing around in front of it.

University Professor Wanted as Chauffeur


workrooms, 6th floor.

CHAUFFEUR wanted, experienced, safe, careful; excellent mechanician, ready and able to make repairs and take care of machine; willing worker all hours, polite, neat; single, young; speaking fluently Spanish, French, English; able act employer's valet, secretary; if have knowledge typewriting, stenography, the better; give references. Diplomat, 511 Herald.

CHAUFFEUR, coachman wanted; one who has had experience Packard cars and car driving state experience

The above advertisement in the help wanted columns of a New York newspaper recently has attracted an immense amount of notice in motordom of the metropolis. The requirements are so clearly stated that no mistake could be made. The main difficulty about the whole matter would be to find any human being who possessed all the essentials asked for by the would-be employer.

If the advertiser was really looking for such a paragon as he describes, he would better gain entree to Heaven first off, for as

a leading member of the chauffeur industry expressed it: "There ain't no such thing possible."

It would be illuminating to know if this advertiser ever considered what he was asking for. According to his advertisement, he wants an experienced driver. As a driver the applicant must be careful and safe. Under the beneficent Callan law, that is all attended to by the searching (?) examination to which the chauffeurs were subjected prior to being invested with the dignity of a license. If the man does not get panicky while driving twenty-five miles an hour he may be considered a safe driver. If he can go thirty miles an hour without cutting down an undue number of telegraph poles he may be designated a careful driver. It is of course understood that "if one can not be safe one might as well be careful." Careful drivers retail at about $30 per week. So much for the driving.

Then he must be an excellent mechanician, ready and able to make repairs and take care of a machine. It is to be assumed that a license granted by the sovereign State of New York presupposes some knowledge of the automobile, but where a chauffeur gets only $30 a week the question would be raised immediately: "How on earth are the garages going to break even if a $30 man really makes all the repairs himself?"

Naturally it is to be surmised that the advertiser intended to make some sort of monetary provision for mechanical repair work, in the shape of additional emolument to the chauffeur-mechanician—say $10 a week.

Then, this workman must be a willing laborer and hold himself in readiness to labor at all hours. He must be polite, neat, single and young. Middle-aged, married men are not to be considered no matter how neat and polite their domestic condition presupposes. Of course no married man could hold himself in readiness to work at any hour of the night or day outside of his own domain; nobody but reporters and Pullman car porters ever do that.

But listen! In addition to those other qualities, the applicant must have a fluent speaking knowledge of French, Spanish and English. Any man who has such knowledge of languages can pull down at least $25 a week tutoring. So up this stage the applicant ought to be good for at least $65 a week.

But now the conditions of the race begin to draw. Beside all the sterling qualities insisted upon in the foregoing, the advertiser states that this wonder among chauffeurs shall be able to act as valet. That ought to be worth at least $10 a week of any man's money. But hark! This chauffeur-mechanician-linguist-valet must be able to act as secretary to his employer. Now a secretary who is a secretary at all and not a blackmailing menace cannot be had under $40 a week at an inside tip-over figure. So all told the weekly insult to be handed to the successful applicant would now total $115 a week.

Just at the end of the advertisement it is stated that a knowledge of typewriting and stenography is to be desired in the applicant. Thus a dividing line may be reached by the advertiser in sorting out his flood of answers. All the chauffeur-mechanician-linguist-valet-secretaries who can work the typewriter and take short-hand dictation will be preferred over the chauffeur-mechanician-linguist-valet secretaries who are not so liberally endowed. If they are, the successful one ought to get at least $10 a week more, because a knowledge of typewriting and stenography is a merchantable asset and deserves to be paid for.

Finally this modest advertiser wants references.

The questions that immediately obtrude themselves are:

First—Is it possible for one single human being, and young at that, to have all the qualities, at any price?

Second—If there is such an individual, would he consent to work for any other human being alive?

Third—If he was found to exist and willing to work, how much would he be able to demand in the way of salary?

Fourth—If he agreed to go to work, being fully equipped according to specifications, how long would it be before his mentality, knowledge and remarkable qualifications would raise him vastly higher than the man who had the nerve to employ him?

Fifth—How he would shine in comparison with his employer?

But to get back to earth again. The leading members of the Professional Chauffeurs' Club of America, sober professionalists who are not in business for fun or for health, declare that the brain that conceived such an advertisement as appears above is fully capable of offering $20 a week for a duly qualified man. If the applicant accepts, the employer will get the worst of it; but he will never know, according to the clubmen.

What Two Polecats Had to Say

First skunk: "Say, Andy, what is that odor?"

Second skunk: "Why, Sam, don't you know?"

First skunk: "No, Andy; it beats all the smells I know of. What can it be?"

Second skunk: "Why, Sam, I am greatly surprised; don't you really know?"

First skunk: "Honest Injun, Andy, it beats me. What is it?"

Second skunk: "Why, Sam, that's the Callan automobile law."

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, RACES, HILL CLIMBS, ETC.

Oct. 18	New York City, Madison Square Garden, Electric Car Day at the Electric Show.
Dec. 1	Chicago, Ill., First Annual Aeronautical Exhibition in the Coliseum.
Dec. 31-Jan. 7, '11.	New York City, Grand Central Palace, Eleventh Annual International Automobile Show.
Jan 7-14, 1911	New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.
Jan. 15-21, 1911	Detroit, Wayne Gardens, Detroit Automobile Dealers' Association.
Jan. 16-21, 1911	New York City, Madison Square Garden, Eleventh Annual Show, Commercial Division, A. L. A. M.
Jan. 28-Feb. 4,'11.	Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.
Feb. 6-Feb. 11,'11.	Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.
Mch. 4-11, 1911	Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.

Races, Hill-Climbs, Etc.

Oct. 6-8	Santa Anna, Cal., Track Meet.
Oct. 7-8	Los Angeles, Cal., Speedway Meet.
Oct. 8	Philadelphia, Fairmount Park Race, Quaker City Motor Club.
Oct. 14-18	Washington, D. C., Start of Washington Post Reliability Run to Richmond, Va.
Oct. 15	Long Island Motor Parkway, Grand Prize, Automobile Club of America.
Oct. 15-16	Philadelphia, Roadability Run, Automobile Club of Philadelphia.
Oct. 15-18	Chicago, Ill., Chicago Motor Club's 1,000-Mile Reliability Run.
Oct. 27-29	Dallas, Tex., Track Meet.
Oct. 28-29	New York City, New York "American's" Motor Truck Contest.
Oct.	Exhibition Auto vs. Aeroplane, Dutchess County Fair, Poughkeepsie, N. Y.
Nov. 3-5	Atlanta, Ga., Speedway Meet, Atlanta A. A.
Nov. 5-6	New Orleans, La., Track Meet.
Nov. 10-12-13	San Antonio, Tex., Track Meet.
Nov. 24	Redlands, Cal., Hill Climb.
Nov. 24	Savannah, Ga., Road Race, Savannah Automobile Club.

THE AUTOMOBILE

Vol. XXIII. Thursday, October 6, 1910 No. 14

THE CLASS JOURNAL COMPANY
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ENGLAND:—W. H. Smith & Sons, Ltd., 186 Strand, London, W. C., and all bookstalls and agencies in Great Britain; also in Paris at 248 Rue de Rivoli.
FRANCE:—L. Baudry de Saunier, offices of "Omnia," 20 Rue Duret, Avenue de la Grande Armee, Paris.
GERMANY:—A. Seydel, Mohrenstrasse 9, Berlin.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

LET there be no mistake; the "Sixth Annual Vanderbilt Race" is the finishing touch to what has been a long-drawn-out struggle betwen the classes of cars that are made on a stock basis and the character of automobile that is specially made.

* * *

PROOF is now at hand that the special car is a nondescript; it is just what experience teaches that it must be, *i.e.*, the embodiment of freak ideas; expression of the man who thinks that an automobile must be a squawking rooster to be the "cock of the walk."

* * *

NOTHING can be plainer than the record as it stands; "despised" stock cars crowded each other at the finish; special construction automobiles went down before the onslaught, and were responsible for slaughter.

* * *

EVOLUTION, not revolution, wins. The stock car is the product of evolution; the special car is the instrument of revolution. Revolution beggars description; it has beggared the South American Republics; it will beggar the automobile makers who tolerate it, and it will thrice beggar the citizen who invests in one; nor does it matter whether it is a revolution that has the smell of burnt powder or one with the odor of partly burned gasoline.

DESTINY jokes with the joker; the wise purchaser, after witnessing the Vanderbilt Cup Race, will very properly decide that the stock car, as bad as the maker thereof thinks it is, is far better than the same maker's specially constructed car, on which he has wasted so much time and money that he is compelled to either perpetrate a fraud upon his own stockholders or pass the annual dividend.

* * *

WISDOM is a stowaway in the frock of cupidity; it is a strange brand of cupidity that is present when a maker of automobiles fits out his plant with special forms of machinery that will further the building of automobiles on a standard basis at a low cost, and then tries to beat his own good method; resorting to model-making in the process.

* * *

THINGS are not always what they seem. It is model-making when one model is hand-whittled; nor does it make any difference as to the shop in which the model is developed. Few models ever work satisfactorily; model-makers of the greatest competence invariably claim that models have to be put through a refining process to ultimately realize good results.

* * *

THE deceiver deceives himself. Instead of taking advantage of the refinements that naturally creep into a stock model as it is refined on a basis of necessity from year to year, the maker, not knowing his own business as well as one would reasonably expect that he should, thinks to do better, but, by a poorer way, and ends up by making the sad discovery that he is not even a good model maker.

* * *

WHEN railroad trains get off the track they go to smash; the same results accrue to the makers of automobiles when they risk their reputations in the keeping of poor special models instead of good stock automobiles. The makers with special models are bumping along the ties.

* * *

MODEL-MAKING should be confined to a small plant devoted to nothing else; when models are sufficiently revised and refined they have the qualities that belong in stock products. What chance is there then for a mere model in competition with a stock proposition?

* * *

FROM this time on purchasers of automobiles will shun special cars; they will know that they are crude models; it will be easy for them to appreciate the fact that it is in regularly made automobiles that habit lurks—the habit of accomplishing all that is good.

* * *

LOOKING backward affords the perspective necessary to convince man that improvements are wrought as time goes on. It is a little difficult, however, to discover any sign of improvement in the method that was adopted for the management of the Vanderbilt Cup Race. Perhaps the management was a little absent-minded; or maybe the investors wanted to get their money back

General Motors Finally Gets Support

$15,000,000 First Lien, Five-Year, Sinking Fund, Gold Notes, Issued—J. & W. Seligman & Co., New York, and Lee Higginson & Co., Boston, Underwriting the Issue.

Settles the Immediate Future of Twenty-one Component Automobile Companies, and Blows Away the Clouds That Threatened the Whole Industry for Several Months.

DEFINITE announcement of the financial plan adopted to solve the tangled problem of the General Motors Company was made late Wednesday afternoon, when it was officially stated that J. & W. Seligman & Co., of New York, and Lee, Higginson & Co., of Boston, had underwritten an issue of $15,000,000 6-per cent. first-lien, five-year gold notes based upon all the assets of the twenty-one component companies represented in the holdings of the General Motors Company. These companies are: Buick Motor Co., Cadillac Motor Car Co., Olds Motor Works, Marquette Motor Co., Cartercar Company, Oakland Motor Car Company, Rapid Motor Vehicle Co., Northway Motor & Manufacturing Co., Elmore Manufacturing Co., Reliance Motor Truck Co., Welch Company of Detroit, Weston-Mott Company, Randolph Motor Car Co., Welch Motor Car Company of Pontiac, Jackson-Church-Wilcox Co., Michigan Motor Castings Co., Champion Ignition Co., Michigan Auto Parts Co., McLaughlin Motor Car Co., Ltd., General Motors Company of Michigan, Oak Park Power Co.

The total issue authorized was $20,000,000, but the remainder not included in the terms of the underwriting may only be issued with the aproval of the company's finance committee which is to be nominated by the bankers.

The issue is designated positively as sinking fund notes. The assets of General Motors are estimated by the bankers at $37,383,000, about $12,000,000 of which is represented by real estate holdings and equipment of plants, subject to real estate obligations aggregating $266,500.

The funded debt and capital stock of General Motors, including the new issue, will be as follows:

$15,000,000 first-lien, 6 per cent., five-year, sinking fund, gold notes.

$17,835,400 7 per cent., cumulative, preferred stock, $2,800,000 of which is held by the company or its subsidiaries.

$20,835,030 common stock.

The Central Trust Company of New York has been designated as trustee, and mortgage notes and shares of stock of subsidiary companies securing the issue will be deposited under the trust deed which has been executed.

The majority of the stock deposited under voting-trust agreement will be voted by the trustees designated by the bankers to nominate a majority of the board of directors of the company within three weeks. This applies also to the subsidiary companies. Six out of seven members of the finance committee of General Motors and a comptroller for each of the component companies will also be selected.

The whole transaction simply means that the control of General Motors, with all it represents, has passed into the hands of a board of directors and a finance committee named by the financial interests who have underwritten the notes.

They will administer the properties for the next five years, and if at the expiration of that period the notes have been taken up, control of the property will revert to the present owners.

In the preliminary statement issued by the bankers, a most rosy view of the future of the company is taken.

To the trade, the settlement of the financial troubles of General Motors is of prime importance. The clouds that have beset that company for months have darkened the horizon of the whole business and the storm that has been averted by the consummation of this deal has been a very real menace to a number of companies not directly involved.

The talk of ruinous cutting of prices which has been heard at intervals recently will be stilled and the danger of the crumbling of a giant fabric, the falling of which must inevitably have buried dozens of companies in its ruins, has been averted.

In their statements to the public the bankers declare that the trouble with General Motors in the past year has been over-enthusiastic production and they assert that with conservatism as the keynote of the new régime, the business has a profitable future.

A damper was cast over the whole trade when it was announced recently that the Buick Motor Company, one of the largest of the members of the General Motors, was obliged to offer to sell one-year 6 per cent. notes at 85. This deal, which meant that the company would have to pay 21 per cent. for the use of money, is nullified by the huge underwriting plan that has been accepted.

It is planned to settle all outstanding obligations of the companies under the supervision of the new finance committee and then to provide a fund of at least $3,000,000 as working capital.

Flight at High Altitudes

BY MARIUS C. KRARUP. TRANSLATION AND REVIEW OF AN ARTICLE BY HENRY PETIT CONSIDERING EFFECTS OF ALTITUDE ON MOTOR AND AEROPLANE FUNCTIONS

ACCORDING to a fable dating back to remote antiquity the birds of the air once upon a time held a contest to determine which could fly to the highest altitude, and he was to be acclaimed as the king of their tribe. The eagle flew far up above the mountain peaks and none could follow him, but when he had reached as far as he could and surveyed all the rest far below a little tom-tit who had alighted on the eagle's back farther down, unnoticed, swung himself still a hundred feet higher into the atmosphere and chirped merrily, and he was chosen to be the king of fliers.

And this fable shows not only that altitude was considered a good test of flying ability long before the mechanical flier was invented, but also that tricks were counted good sport and that the originator of the fable had an instinctive understanding of the requirements, for he seems to have guessed that if the tom-tit had no real ability to compete with the eagle in thin air he could overcome this deficiency for a few seconds by saving his muscular power for one supreme effort. Fitness of the supporting surfaces, relatively small weight and relatively high power are the interchangeable qualities which enable the flier to rise into rarefied air, and, at least for all military purposes, these qualities, which also make for high speed, must determine the strategical superiority of one mechanical flier over another. If the dirigible balloon can be made dirigible indeed and can fly one thousand feet higher than the aeroplane—its worst enemy under war conditions—the latter will not be able to overtake it and harm it, though endowed with four times greater speed in the lower strata, and there will be room for both balloons and aeroplanes in whatever warfare may be necessary for preserving peace. The curious anomaly will then be witnessed of two kinds of war instruments, both effectively at work but neither able to injure the other, because one can get away horizontally and the other vertically.

But with regard to aeroplanes mutually the competition for instilling into them the ability to fly high must become as keen as the love for gold. No other quality, excepting only a perfected equilibrium, will be sought so ardently by constructors, since it will mean speed and safety, whether in peace or war, and will command the highest price for either purpose. And the competition will be saved from becoming a one-sided development of freakish machines by the necessity of preserving to the utmost possible extent the capacity for carrying the fuel for prolonged flights and a maximum of useful or warlike load. Having somewhat lightly set aside for the present the problem of equilibrium as one too difficult for immediate solution, the world of aeroplane constructors seem to have, as of one mind, comprehended the importance of altitude competitions and are straining their mental vision to perceive clearly the mechanical requirements for reaching great heights.

To this end it is, of course, necessary first to perceive what the effects of a rarefied atmosphere must be on each and all of the elements of an aeroplane machine. A synopsis of these effects is presented by H. Petit in *La Vie au Grand Air* for September 17 and, as an introductory to the study of the problems involved, this synopsis is reproduced in substance and with a few annotations in the following.

The elements and functions considered separately are: The motor, under which the carburetion, the compression, the ignition, the cooling, and the power; the propeller; the sustentation; the propulsion; the pilot.

The Motor.—The air's density diminishes with increasing altitude. At a height of 5,500 meters its specific gravity is reduced to one-half. The height record achieved by Chavez before his tragic death was already 2,600 meters. At this altitude the barometric pressure equals that of a column of 560 millimeters of quicksilver. To illustrate the problem, a pressure of 500 millimeters may be assumed which corresponds to a height of about 3,000 meters, a height which may now be reached almost any day. The normal pressure at the level of the sea is 760 millimeters; so the pressure at 3,000 meters is practically two-thirds of the normal. The effects of this reduction on the functioning of the motor may now be followed step by step from the entrance of a cylinderful of the rarefied air in the air channel of the carbureter until its exit through the exhaust tube.

Carburetion—The quantity of gasoline drawn in is practically a function not of the absolute pressure of the air, but of the difference in pressure above and below the jet. This difference and consequently the discharge from the jet will remain practically constant. But the mass of the vapor drawn in diminishes in the proportion of 3 to 2, and the mixture will therefore be too rich. This may be remedied by opening the additional air intake more widely, but in that case the automatic carbureter must be renounced. It is also to be noted that the effect mentioned is produced in equal measure when the gasoline is injected in liquid form. In all cases the discharge must be subject to regulation. (The fact that the lowered pressure will have the effect of depressing the gasoline in the jet might also be considered, as well as possible changes in the velocity of the air current. Possibly these factors have a tendency to maintain the quality of the mixture. But only definite and systematic experiments can probably settle these questions).

Compression—Suppose that the motor's normal rate of compression is 6 atmospheric pressures. The air admitted at 3,000 meters is no more at a pressure of 1 atmosphere and the final compression will be at the rate of 6 times 2-3 instead of 6 times 1; that is, 4 atmospheric pressures. By this reduction the efficiency and power of the motor are reduced to about 3-4 of what they were at the level of the sea, according to the accepted tables scheduling the effects of various rates of compression. A 50-horsepower motor will then from this cause alone be reduced to an output of 38 horsepower at an altitude of 3,000 meters. Only a motor whose compression may be varied at the will of the operator would remedy this effect, and none such has as yet been perfected, though it may shortly appear.

Ignition—The explosive mixtures burn so much more rapidly as they are more compressed. To get complete combustion when the compression is reduced it will therefore be necessary to vary the timing of the spark accordingly.

The explosion and the exhaust will apparently take a normal course, but the cooling of the motor will be affected.

Cooling—If air-cooling is employed, it seems that the motor will tend to heat up, as thin air will remove fewer calories than air of greater density. (At this point the heat loss due to radiation should really be considered as well as that due to convection). The effect of reduced heat convection should be so much more pronounced as the thermic efficiency is reduced from the other causes mentioned, leaving more waste calories to be carried away. On the other hand, the fuel charge is also somewhat reduced. An example will illustrate the proportions. Suppose the gasoline burned at sea level in a given length of time develops 100 calories and that the thermic efficiency of the motor is 30 per cent. There will then be 30 calories transformed into work, 35 carried away in the exhaust and 35 removed by the cooling air. At a height of 3,000 meters, if the carburetion remains normal through suitable provisions to this end, the burned gasoline will develop only 100 multiplied by 2-3, say 66

calories. The efficiency, reduced 1-4 by the diminished compression, will be 22 per cent. instead of 30 per cent. Hence only 14 calories out of the 66 will be transformed into work. There remain 52 calories, of which 26 will be passed with exhaust and 26 are to be carried away in the air. Will the motor heat? The answer is easy. At the sea level the air at normal density carried away 35 calories. At a density reduced to 2-3 it will carry away in proportion; that is, 23 calories, which is only slightly less than the 26 which should be carried away. (When radiation of heat is also considered it seems probable that even this slight deficiency arrived at by Mr. Petit will disappear.) If water cooling is employed the same reasoning applies, since the air after all remains the last medium for absorbing the surplus heat. But the lowered boiling point of water at high altitudes is to be looked out for.

The Power—With the mixture at its best proportions the fuel charge is reduced to 2-3, and the reduced compression further reduces the efficiency to 3-4. The motor having 50 horsepower at the sea level will therefore at an altitude of 3,000 meters have 50 horsepower multiplied by 2-3 and this again multiplied by 3-4; that is 25 horsepower. The power is reduced to one-half.

The most obviously suggested remedy would seem to be the use of an air compressor for supplying the carbureter with air at a constant pressure.

The Propeller—Working in a thinner medium, the propeller at any given speed of rotation will of course produce a proportionately weakened thrust, and a motor adapted to maintain its power at the increased altitude and well proportioned for its work at sea level will tend to run wild at the higher speed produced by the reduced resistance. A motor which will maintain its torque under these conditions must be one of the requirements. And a propeller with variable pitch or otherwise adapted for variable speeds suggests itself. (As referred to later, the resistance to propulsion diminishes in the same ratio as the propeller thrust, and, so far as mere speed is concerned, the altitude should therefore make little if any difference, but the work of the propeller is to produce sustentation also, and for this purpose an increased forward speed of the aeroplane is required, and this in some manner must be produced by the propeller and by the motor. Mr. Petit presents his version of the requirements in this respect).

Sustentation—Long calculations would be required for arriving at definite conclusions with regard to the influence of the rarefaction of the air upon sustentation and propulsion. (And then the results would be extremely doubtful for lack of experimentally ascertained data.) Only the direction in which the various forces will tend can be indicated. The sustentation may be looked upon as an action of the planes upon the molecules of the atmosphere. When the number of the molecules is reduced by rarefaction, either the planes must be held and balanced at an increased angle of incidence so as to act against as many molecules in a given time as at sea level, or the forward speed must be increased, this resulting partly in attacking an increased number of molecules and partly in attacking them, each of them, more vigorously. (Mr. Petit here assumes that the planes, as ordinarily constructed, attack a maximum of air molecules for a given plane area and also that they attack these molecules as vigorously as possible. He is interested in speed.) The increased speed is evidently the more interesting alternative, since there is always a loss in departing from the normal tilt. As sustentation is proportionate to the square of speed, at equal densities of the air, the speed required for converting a 2-3 sustentation into one full sea level sustentation must be the speed at sea level multiplied by the square root of 3-2, or approximately 1-2.

Propulsion—With the speed increased in this proportion, it is interesting to determine what the value of the drift or horizontal thrust will be. It is increased by the higher speed, but reduced by the smaller density of the air. The inert portions of the machine, such as frame, motor and aviator's body, offer less resistance than at sea level. On the whole it seems that the drift, so-called, should remain about the same.

Summarizing at the high altitudes the power of the motor is reduced; to obtain support one must increase either the speed or the tilt and the propeller must turn more rapidly. A motor disposing over an excess of power is therefore indispensable so much more as the work expended in rising is far from being negligible. (The logic of this inference in favor of higher power does not seem clear. Even the power to rise is required as much near sea level as at greater heights. But the reasoning is an example of that which passes current at present in favor of high motor power. An excess of power is of advantage at all altitudes if it may be obtained without sacrifice at other points, but the author has scarcely shown that it is power which is required for producing the indispensable increase of speed in the thinner air. He has shown that the ordinary motors lose part of their power in the thinner air and that something must be done to obviate this loss. The increase of the original motor power represents only the readiest method for having enough power left after the loss is sustained).

The rise of an aeroplane weighing 500 kilograms, with everything on board, from sea level to a height of 3,000 meters necessitates an expenditure of 1,500,000 kilogrammeters of energy, and if the apparatus rises to the height mentioned in one-half hour not less than 11 horsepower is employed for rising only, representing a power requirement to be added to that necessary for propulsion and sustentation. (But for rising at the same rate to a height of only one thousand feet the same additional power is wanted. The difference is only one of the continuity of the effort).

The Pilot—Finally the flights at high altitudes already made by Chavez and others have shown that it is necessary to consider in the first line the influence of rapid changes in the density of the atmosphere upon the aviator, physically and mentally. With the reduced pressure from the outside the gases dissolved in the blood and contained in the vessels of the body tend to escape, and this tendency often causes grave troubles in the circulation, well known under the name of mountain fever and similar to those experienced by divers suddenly rising to the surface after working at considerable depths.

Recent Events Among Aviators

Arthur Brookins started in a Wright biplane from Chicago at 9:15 a. m., Sept. 29, descended at Gilman, Ill., 75 miles from Chicago, at 11:43 a. m., resumed flight at 12:41 p. m., descended at Mount Pulaski, 88 miles further, at 3:30 p. m., repaired a broken pump, ascended again at 3:48 and arrived at Fair Ground, Springfield, Ill., at 4:25 p. m., having covered a distance of 187 miles in all. The machine was provided with starting wheels, one of which was broken when the aviator made the ascent from Mt. Pulaski.

The French ministry of war offers to pay a premium of $20,000 to the constructor who furnishes an aeroplane capable of carrying a useful load of 300 kilograms at a speed of at least 60 kilometers per hour in a continuous flight of at least 300 kilometers. Competitors must sign a contract and are allowed $100 extra for every mile of average speed attained in excess of the minimum. In addition to the $20,000 premium the successful constructor receives an order for 20 aeroplanes of the same type at a price of $6,000 for each. If the State selects to manufacture the 20 aeroplanes by means of its own facilities, it will pay the constructor a royalty of at least $600 for each apparatus with an additional bonus for excess speed.

The number of entrants who are expected to start in the projected race from Chicago to New York has now been reduced to three, which is the minimum according to the rules laid down by the newspapers offering the prize of $25,000 for the successful completion of the flight. The three who still propose to try are Charles Foster Willard, J. A. D. McCurdy and Eugene B. Ely. The start is to take place from Hawthorne race track near the Indiana line at 10 a:m. on Oct. 8, if the weather permits, and the voyage must be completed by Oct. 15.

Fairmount Park Field Big

THIRTY CARS WILL FACE THE STARTER ON SATURDAY NEXT—PRELIMINARY PRACTICE SHOWS COURSE IS FASTER THAN EVER

PHILADELPHIA, Oct. 4—Now that the Vanderbilt Cup race is over interest centers in the Fairmount Park road race next Saturday, and it promises to be the greatest ever held over that historic course.

The entries for the race came in with a rush on Monday—two Nationals, two Stoddard-Daytons, Mercedes, Mercer, two Marmons, Simplex, Corbin and three Abbott-Detroits. With a field of thirty and the course faster this year than in the two preceding years, not only the record for the entire course, but the record of 8 minutes 47 seconds, for a lap, made last year by Len Zengle in a Chadwick car, should be broken.

There were about 5,000 persons out at sunrise Monday, the first morning scheduled for practice, and six drivers sped around the eight-mile course until 7:30, at which hour trials must stop. Being the first time, the drivers didn't cut loose and there were no speed thrills.

Every effort is being put forth to safeguard the public and the contestants and every precaution will be taken and ropes drawn on each side of the course and no one allowed to stray on the road. Similarly, a policeman is stationed at each entrance of the park to prevent the entrance of any vehicle between 6 and 7:30 a. m. This will be the rule throughout the week.

Instructions for contestants have been issued and cars will be examined for piston displacement Wednesday after practice.

Policing arrangements have been completed. Three thousand men, an average of one to every 100 feet, will be on guard and no one will be allowed to cross the track from start to finish. With the assurance of a clear track and with the improved conditions of the road a new record for the course is confidently anticipated. Parking places, boxes and seats are selling at a rapid rate, and there are indications that the beneficiaries of the proceeds, all of which go to charity, will derive a greater amount than at any of the preceding contests.

Beginning Monday morning the course will be open for practice from 6 till 7:30 a. m. every day. These early morning spins are a great source of interest in themselves, and have always attracted crowds of spectators. List of entries follows:

No.	Car	Entrant	Driver
2	Chadwick	Chadwick Eng. Works	Lew Zengle
3	Chadwick	Chadwick Eng. Works	Al Mitchell
4	Benz	Benz Auto Import Co.	Irwin Bergdoll
5	Benz	Benz Auto Import Co.	Ed Hearne
6	Apperson	Apperson Bros. Auto Co.	H. M. Hanshue
7	Jackson	Jackson Auto Co.	E. F. Scheiffler
8	Cole "30	Cole Motor Car Co.	"Bill" Endicott
9	Cole "30"	Cole Motor Car Co.	Harry Endicott
10	Simplex	J. Fred Betz, 3d	Mr. Betz.
11	Simplex	John Megraw	W. C. Mullen
12	Ford	Ford Motor Co.	F. Kulick
13	Benz	Al Hall	Al Hall
14	Benz	C. A. Bergdoll	C. A. Bergdoll
15	Marmon	Nordyke & Marmon Co.	Harroun
16	Marmon	Nordyke & Marmon Co.	Dawson
17	Stoddard-Day.	Stoddard-Dayton Auto Co.	H. N. Harding
18	Stoddard-Day.	Stoddard-Dayton Auto Co.	T. De Hymel.
19	Mercedes	Mr. Jagersberger	T. J. Wosser
20	National	National Motor Car Co.	Aitken
21	National	National Motor Car Co.	Wilcox
22	Mercer	Mercer Motor Car Co.	H. Frey
23	Simplex	Robt. E. Hitemeyer	R. Beardsley
24	Corbin	Corbin Motor Vehicle Co.	Joe Matson
25	Abbott-Detroit	Abbott-Detroit M. C. Co.	.....
26	Abbott-Detroit	Abbott-Detroit M. C. Co.	.....
27	Abbott-Detroit	Abbott-Detroit M. C. Co.	.....

Records Go at Winnipeg Meeting

WINNIPEG, Oct. 3.—New records for 1 and 25 miles were hung up here Saturday for the Dominion of Canada, at the fourth annual meet of the Winnipeg Automobile Club.

W. C. Power, in a McLaughlin-Buick "40," lowered the Canadian mile track record to 59 seconds, and in the Dunlop Trophy race of 25 miles he covered the distance in 25 minutes, 19 1-5 seconds. Owing to the number of entries in the last race, he was forced to keep entirely to the outside of the track, thereby covering more than the distance. His speed in this event was better than a mile a minute for the distance. The summary:

No.	Car	Driver	Time
	Dunlop Trophy Race, Twenty-five Miles—		
1	McLaughlin-Buick	W. C. Power	25:19
2	National	W. Guest	26:24
3	KisselKar	A. Moore	
	One Mile Time Trial—		
1	McLaughlin-Buick	W. C. Power	:59 1-5
2	National	W. Guest	1:01 4-5
3	Knox	R. Husk	1:03
	Five-mile Motor Cycle Race, Open—		
1	Indian, 7 h. p.	J. Baribeau	5:25
2	Indian, 5 h. p.	Burgess	
	Five-mile race for cars up to 160 cubic inches—		
1	Maytag	Harn	6:25
2	McLaughlin	Cline	
	Ten-mile race for cars from 161 to 230 cubic inches—		
1	Warren-Detroit	D. A. Brown	12:40
2	McLaughlin	J. Cline	
3	Maytag	Harn	
	Ten-mile race for cars from 231 to 300 cubic inches—		
1	McLaughlin-Buick	W. Guest	11:19
2	Warren-Detroit	J. Brown	
3	Knox	Houghton	

Correction

In a recent issue of THE AUTOMOBILE it was made to appear that Velie car, Number 51, which took third place in the free-for-all at the Algonquin hill climb, was driven by Cooney. It appears that through a transposition in the program, the car carded to be driven by Cooney was driven by J. H. Stickney.

Accident Spoils Springfield Races

SPRINGFIELD, Oct. 3—The race program at the State Fair was sharply abridged Saturday afternoon by an accident in which Larue Vredenburgh, president of the Springfield Automobile Club, was killed while driving in competition.

The summary of events that preceded the mishap is as follows:

Car	Driver	Time
Five-mile race for fully equipped stock cars driven by amateurs—		
Jackson	Bisch	5:42
Stoddard-Dayton	Vredenburgh	
Chalmers-Detroit	Hicks	
Ten-mile race for cars under 600 cubic inches displacement—		
Falcar	Hughes	10:28 3-5
Cutting	Slagel	
Stoddard-Dayton	Vredenburgh	
Five-mile race for stock chassis of from 231 to 300 cubic inches		
Falcar	Hughes	5:15
Buick	Farr	
Staver-Chicago	Cheney	
Ten-mile race for stock chassis of from 161 to 230 cubic inches		
Buick	Farr	10:24 2-5
Staver-Chicago	Mounckmeier	
Chalmers-Detroit	Hicks	
Five-mile race for gasoline cars of from 301 to 450 cubic inches		
Falcar	Hughes	5:14
Buick	Slagel	
Stoddard-Dayton	Vredenburgh	
Ten-mile race for gasoline cars of from 451 to 500 cubic inches		
Knox	Oldfield	9:59 3-5
Stoddard-Dayton	Vredenburgh	
Jackson	Ellis	
Ten-mile free-for-all—		
Darracq	Kirscher	9:51
Hudson	Hickox	
Moon	Wells	
Five-mile free-for-all—		
Falcar	Hughes	5:13 2-5
Cutting	Tower	
Staver-Chicago	Cheney	
Australian pursuit race for cars under 600 cubic inches—		
Hudson	Hickox	Winner
Twenty-mile race for stripped stock chassis—		
Falcar	Hughes	20:03 3-5
Jackson	Ellis	
Moon	Wells	
Knox	Oldfield	

Good Roads Convention

THIRD ANNUAL MEETING IN ST. LOUIS A GREAT SUCCESS—MANY APPROPRIATE PAPERS READ AND DISCUSSED—ATLANTA NEXT CONVENTION CITY

ST. LOUIS, Oct. 3—Nearly 400 delegates from two-thirds of the States in the Union attended the Third Annual Good Roads Convention at the New Coliseum Wednesday, Thursday, and Friday.

Officers and delegates pronounced the gathering the most successful of good roads meetings. Atlanta, Ga., was selected as the next convention city.

The delegates were welcomed at the opening session by Governor Herbert S. Hadley, of Missouri. He pledged himself to the good roads movement and promised to use his official influence in aid of increased appropriations from both the State and Federal governments.

The official program at the first day's session was not followed. Charles D. Ross, of Newton, Mass., advocated legislation giving the automobile the middle of the road, with horse-drawn vehicles at either side.

A course of instruction in the public schools relative to the danger of children playing or walking in roads was advocated. "Convict Labor in Public Road Construction" was the title of a paper read by Joseph Hyde Pratt, State Geologist, of North Carolina. Major W. W. Crosby, of Baltimore, talked on "Modern Road Construction."

At the second day's session Prof. Arthur H. Blanchard, of Brown University, attacked the American system of permitting city or county engineers to lay out and build roads and then to leave their care in the hands of a different set of officials. Roads should be built and maintained by the same department, he said.

George R. Carter, of Marlin, Tex., told how the commercial bodies of that State organize tours of troupes consisting of six or more motor cars, carrying a complete moving picture show with thousands of feet of films, to be used to demonstrate the benefits to be secured by good roads. Harold Parker, chairman of the Massachusetts Highway Commission, criticised the system of supervising road building in his paper on "State Roads to Meet Modern Traffic Conditions." The list of papers read before the convention the second day included "High Altitude Roads," by F. L. Bartlett, Denver; "Treatment of Earth Roads," by D. Ward King, Jefferson City, Mo.; "Across Missouri Highways," Curtiss Hill, State Highway Commissioner of Missouri; and "Crest of Blue Ridge Highway," Joseph Hyde Pratt, Chapel Hill, N. C.

At the closing session the convention passed resolutions condemning poll-tax road labor.

This National Convention Committee was selected: George C. Diehl, Buffalo, N. Y., chairman A. A. A. Good Roads Board; N. J. Bachelder, Concord, N. H., Master National Grange; Charles S. Barrett, Union City, Ga., president Farmers' Union and Co-operative Association; Logan Waller Page, Washington, D. C., Director United States Office of Public Roads; L. H. Kittredge, Cleveland, President National Association of Automobile Manufacturers; R. D. Chapin, Detroit, chairman N. A. A. M. Good Roads Committee; Alfred Reeves, New York City, General Manager Association Licensed Automobile Manufacturers; Harold Parker, Boston, State Highway Commissioner of Massachusetts; Fred Atwater, Bridgeport, Conn., President American Wheelmen; C. J. Butler, Detroit, Motor and Accessory Manufacturers; S. Percy Hooker, Albany, N. Y., State Highway Commissioner of New York; Lewis R. Speare, Boston; Robert P. Hooper, Philadelphia; A. G. Batchelder and Charles Thaddeus Terry, New York.

Philadelphia Club Arranging Tour

PHILADELPHIA, Oct. 3—The fall tour of the Automobile Club of Philadelphia to Atlantic City and return, over entirely new route, will take place Saturday and Sunday, October 15 and 16.

The itinerary of the trip calls for a run of 126 miles the first day, from Philadelphia through Salem, Bridgeton, Port Elizabeth, Tuckahoe to Atlantic City, and a return journey of 86 miles through the Jersey pine lands. The entries already received are as follows:

No.	Car	Driver
1	Chalmers	Harvey Ringler
2	Jackson	Ira L. Brown
3	Cadillac	Henry Shock
4	Franklin	George Karlavghan
5	Winton	Paul M. Elsasser
6	Marmon	Joseph Hudson
7	Stevens-Duryea	Frank W. Hitchcock
8	Stanley	Frederic Wilcox
9	Cutting	Mrs. Charles A. Wolf
10	Marion	Allan Lund
11	Premier	H. E. Grant
12	Welch-Detroit	Edward Wilkie
13	Franklin	.....
14	Premier	Carl Zentmayer
15	Buick	Edward Wilkie
16	Pierce-Racine	S. Walter Harper
17	Locomobile	Howard McTurk
18	Pullman	W. C. Longstreth
19	Stanley	D. W. Harper
20	Mitchell	W. J. Vogler
21	Stevens-Duryea	F. W. Eveland

Grand Rapids to Have Auto Show

GRAND RAPIDS, MICH., Oct. 3—Grand Rapids' second annual automobile show probably will be held February 15 to 18 inclusive. This is the week following the big Chicago exhibition. As was the case last year, the show will be under the auspices and management of the Grand Rapids *Herald*.

Correcting a Wrong Impression

It was erroneously stated in some of the *newspapers* on September 29 that the Emil Grossman Co. will go into liquidation and wind up its affairs. There is no foundation in fact for this statement. The real situation is that the Eagle Co. of Newark, N. J., has taken over the wind shield and spark plug business of the Emil Grossman Company, and Emil Grossman is now sales manager of the Eagle Co., with headquarters at his old stand, 232 W. Fifty-eighth street, New York, where he is carrying on the business of the Emil Grossman Company, independent of the part of the business that was taken over by the Eagle Co. It will be remembered that Emil Grossman held a large interest in the Motor Car Equipment Co., which interest, as he now states, has been disposed of. Referring to the Eagle Co., which is controlled by the Standard Co., of Torrington, Conn., it is preparing to do business in a very large way with the Red Head spark plug and the wind shield enterprise as formerly carried on by Emil Grossman, utilizing the large building in Newark which was formerly occupied by the Domestic Sewing Machine Co. This plant is being fitted out in o most comprehensive way with the necessary special tools and equipment for the making of accessories.

Schacht Company Extending Plant

The Schacht Motor Car Company, Cincinnati, is building a new factory. The building is to be 500 feet long by 70 feet wide and three stories high. It is being constructed of buff pressed brick and will have offset boiler and engine rooms. Its cost will be $100,000 without equipment.

The Vanderbilt Race by Laps

The race was started at 6 o'clock, National No. 1, driven by Livingston, leading the way. Oldsmobile No. 5 broke an oil pump before the start and did not appear on the line. All the cars got away in good shape except Marquette-Buick 29, L. Chevrolet, which stalled its motor just after passing the line. The first car to complete the round was Lozier 2, but it was not in the lead on a basis of elapsed time. Marquette-Buick 29, despite its mishap at the start, was pushed through the lap in 10:46, the fastest time ever made for a first lap under the circumstances. Knox 32 was second in 11 flat and the other two Marquette-Buicks were tied for third and fourth places, 3 seconds behind. Columbia 12 went out before the end of this round through a skid from a bridge caused by a bursted tire.

Lap 2—All of the cars remaining in the race completed the second lap, except the Royal Tourist, which broke a camshaft and retired. Marquette-Buick 29 held the lead with its stablemate, 27, in second place, and the Knox 3 close on their heels. Marmon 25, Alco 18 and Lozier 2 followed in close order. The Jackson 19 was reported with a broken rod somewhere up the stretch. The leaders were all driven at a terrific clip.

Lap 3—There was no change in the order of the first three

Vanderbilt Race Analyzed

OFFICIAL TABLE SHOWING THE TOTAL AND LAP TIMES OF EACH OF THE THIRTY CARS THAT

No.	Car	Driver	Mechanician	1st Lap 12.64 M.	2nd Lap 25.28 M.	3rd Lap 37.92 M.	4th Lap 50.56 M.	5th Lap 63.20 M.	6th Lap 75.84 M.	7th Lap 88.48 M.	8th Lap 101.12 M.
18	Alco	H. F. Grant	F. Lee	11:33	22:49	34:02	45:18	56:32	67:44	79:02	90:20
25	Marmon	Geo. Dawson	Bruce Keen	11:33	11:16	11:13	11:16	11:14	11:12	11:18	11:18
10	National	J. Aitken	Ed. Coddington	11:12	21:58	32:48	43:42	54:52	65:43	76:36	87:26
31	National	L. A. Disbrow	R. Albrecht	11:12	10:46	10:50	10:54	11:10	10:51	10:53	10:50
2	Lozier	Ralph Mulford	Joe Horan	11:31	22:35	33:39	44:52	56:04	69:54	83:27	94:52
17	Pope-Hartford	J. Fleming	C. R. Faeth	11:31	11:04	11:04	11:13	11:12	13:50	13:33	11:25
11	Simplex	L. Mitchell	W. Driggs	11:51	23:03	34:13	45:35	56:48	68:04	79:16	91:08
7	Benz	E. A. Hearne	L. B. Randell	11:51	11:12	11:10	11:22	11:13	11:16	11:12	11:52
15	Stoddard-Dayton	H. W. Harding	C. Mason	11:14	22:08	33:04	44:04	55:05	66:07	77:05	87:59
22	Pope-Hartford	Bert Dingley	C. F. Ossgood	11:14	10:54	10:56	11:00	11:01	11:02	10:58	10:54
20	Oldsmobile	H. B. Stillman	J. Schiller	11:35	22:31	33:39	44:46	55:51	66:55	78:	89:07
16	Benz	D. Bruce-Brown	Fritz Cramer	11:35	10:56	11:08	11:07	11:05	11:04	11:05	11:07
1	National	Al. Livingston	R. Vernon	11:46	23:19	34:41	46:07	57:24	68:41	79:57	91:15
9	Amplex	T. P. Jones	H. Warren	11:46	11:33	11:22	11:26	11:17	11:17	11:16	11:18
6	Simplex	R. E. Beardsley	Glen Ethridge	11:51	23:05	34:22	45:44	57:06	68:44	87:15	99:13
28	Apperson	H. Hanshue	W. Ferguson	11:51	11:14	11:17	11:22	11:22	11:38	18:31	11:58
4	Mercedes	S. E. Wishart	Dan Murphy	11:54	23:26	34:51	46:19	57:46	69:08	83:02	94:22
26	Houpt-Rockwell	C. W. Limberg	Wm. Horning	11:54	11:32	11:25	11:28	11:27	11:22	13:54	11:20
29	Marquette-Buick	L. Chevrolet	Chas. Miller	11:27	22:28	33:26	44:26	55:32	66:34	77:40	88:41
19	Jackson	E. B. Scheifler	J. C. Casey	11:27	11:01	10:59	11:	11:06	11:02	11:06	11:01
21	Marmon	Ray Harroun	H. Goetz	12:37	24:46	36:51	49:11	61:08	73:13	85:04	96:57
24	Stoddard-Dayton	T. De Hymel	L. B. Nottingham	12:37	12:09	12:05	12:20	11:57	12:05	11:51	11:43
27	Marquette-Buick	R. Burman	Howard Hale	11:29	29:43	40:53	51:59	63:08	74:12	89:	100:27
14	Corbin	Joe. Matson	Lyman Alcott	11:29	18:14	11:10	11:06	11:09	11:04	14:48	11:27
3	Marquette-Buick	Arthur Chevrolet	Bob Evans	11:34	34:01	50:39	67:10	83:20	99:23	110:24	121:45
23	American	W. Wallace	Chas. Nauber	11:34	22:27	16:38	16:31	16:10	16:03	11:01	11:21
8	Benz	F. Heim	Frank Dillon	12:13	23:51	35:25	47:07	58:47	70:32	82:16	122:50
32	Knox	Fred Belcher	Jack Coffee	12:13	11:38	12:34	11:42	11:41	11:44	11:44	40:34
30	Royal-Tourist	P. H. Jardine	E. Halvon	14:20	25:37	36:53	48:22	58:49	71:09	82:25	93:41
12	Columbia	H. A. Stone	Wm. Bacon	14:20	11:17	11:16	11:29	10:29	12:20	11:16	11:16
5	Oldsmobile	Joe Nilson	A. C. Scherer	16:32	57:02	74:40	86:33	98:38	110:37	122:52	142:30
				16:32	40:30	16:38	11:53	12:05	11:59	12:15	19:38
				11:22	27:58	39:09	55:10	66:08	77:07	88:09	99:11
				11:22	16:36	11:11	16:01	10:58	10:59	11:02	11:02
				12:15	24:04	35:43	47:29	59:07	71:34	83:18	95:01
				12:15	11:49	10:54	11:46	11:38	11:56	11:44	11:43
				10:46	**21:01**	**31:13**	**41:46**	**52:07**	**62:40**	**73:11**	**83:45**
				10:46	10:15	10:12	10:33	10:21	10:33	10:31	10:34
				102:09	115:22	128:03	140:23	152:37	164:53	177:12	189:27
				102:09	13:13	12:41	12:20	12:14	12:16	12:19	12:15
				35:27	46:21	57:00	67:38	78:20	89:05	99:58	116:47
				35:27	10:54	11:39	10:38	10:42	10:45	10:53	16:49
				12:45	23:37	34:26	45:16	66:55	78:04	88:52	99:42
				12:45	10:52	10:49	10:50	21:39	11:09	10:48	10:50
				11:03	21:39	32:09	42:37	53:	63:40	75:51	86:32
				11:03	10:36	10:30	10:28	10:23	10:40	12:11	10:41
				11:48	23:36	48:30	74:34	86:52	98:57	119:42	137:37
				11:48	11:48	14:54	26:02	12:20	12:05	20:45	17:55
				11:03	29:35	40:24	50:54	61:34	115:59	140:05	
				11:03	18:32	10:49	10:30	10:40	54:25	24:06	Transmission
				11:28	22:34	33:42	45:08	84:02	98:04		
				11:28	11:06	11:08	11:26	38:54	14:02	Cylinders	
				11:51	23:25	34:51	46:25	58:02			
				11:51	11:34	11:26	11:34	11:37	Caught Fire		
				11:	21:45	32:33					
				11:	10:45	10:48	Valves				
				23:24							
				23:24	Cam-shaft						
				Over Bridge on First Round							
				Broke Oil Pump before Start							

TABLE OF RESULTS IN THE MASSAPEQUA SWEEPSTAKES, WON BY THE COLE, AVERAGING 54.93 MILES AN HOUR

No.	Car	Driver	Mechanician	1st Lap 12.64 M.	2nd Lap 25.28 M.	3rd Lap 37.92 M.	4th Lap 50.56 M.	5th Lap 63.20 M.	6th Lap 75.84 M.	7th Lap 88.44 M.	8th Lap 101.12 M.	9th Lap 113.76 M.	10th Lap 126.40 M.
51	Cole "30"	"Bill" Endicott	Harry Endicott	14:06	27:38	41:07	54:40	68:22	81:52	95:10	110:35	124:13	138:04
53	Abbott-Detroit	M. Roberts	Hy. Maher	14:06	13:32	13:29	13:33	13:42	13:30	13:18	15:25	13:38	13:51
52	Cole "30"	Edmunds	James Heis	14:12	28:02	44:16	58:08	72:22	86:20	100:19	114:31	128:53	143:02
54	Lancia	Wm. Knipper	Aug. Guichard	14:12	13:50	16:14	13:52	13:14	13:58	13:59	14:12	14:22	15:09
55	Abbott-Detroit	Lee Oldfield	Jas. Hemstreet	15:22	29:52	44:39	58:50	73:22	89:30	103:57	118:35	133:04	147:15
56	Abbott-Detroit	V. Padula	John Pavee	15:22	14:30	14:47	14:11	14:32	16:08	14:27	14:38	14:29	14:11
				12:35	24:45	36:49	49:06	61:21	73:24	85:32	Turned turtle		
				12:35	12:10	12:04	12:17	12:15	12:03	12:08			
				Did Not Start.									
				Hit Telegraph Pole									

STORY OF THE RACE BY LAPS, WITH TABLES SHOWING AT A GLANCE THE PERFORMANCE OF THE CARS IN THE THREE EVENTS

cars in this round, but the Lozier and Marmon 25 hung a trifle and the gap between them and the leaders was widened somewhat. The Alco made no effort to keep pace with the pacemakers, maintaining a steady rate of speed, about a minute slower for the round than the pathfinders. Marmon 21, Harroun, crossed the tape for the first time, having experienced mechanical troubles soon after the start.

Lap 4—The Knox went out in this round from valve troubles, leaving 28 cars in the race. The place of the Knox in the procession was taken by Marmon 25, while the Lozier and the two Pope-Hartfords trailed along in close company. They were all drawing away from the carefully driven Alco, the leader being over 4 minutes ahead.

Lap 5—Marquette-Buick 29 quickened the pace in this round and slipped away 49 seconds from the flying Marmon. It was followed in its spurt by its stablemate. The leader made the round in 10:21.

Lap 6—This circuit saw the last of Benz 8, Heim, as the car caught fire from a leaky gasoline channel and was retired. The order of the leaders was not changed.

Lap 7—The American 23 succumbed in this lap, a cracked cylinder putting the car out of the running. There were 26 cars

STARTED IN THE VANDERBILT CUP RACE—THE WINNING ALCO AVERAGED 65.18 MILES AN HOUR

9th Lap	10th Lap	11th Lap	12th Lap	13th Lap	14th Lap	15th Lap	16th Lap	17th Lap	18th Lap	19th Lap	20th Lap	21st Lap	22nd Lap
113.16 M.	126.40 M.	139.04 M.	151.68 M.	164.32 M.	176.96 M.	189.60 M.	202.24 M.	214.88 M.	227.52 M.	249.16 M.	252.80 M.	265.44 M.	278.08 M.
101:50	115:16	126:34	137:58	149:25	160:50	172:09	183:27	196:33	**207:57**	**220:51**	**232:06**	**244:36**	**255:58**
11:30	13:26	11:18	11:24	11:27	11:25	11:19	11:18	13:06	11:24	12:54	11:15	12:30	11:22
98:15	**109:25**	**120:17**	**135:23**	**146:42**	**158:13**	**169:45**	**181:02**	**192:32**	211:54	223:11	234:19	245:19	256:23
11:49	11:10	10:52	15:06	11:19	11:31	11:32	11:17	11:30	19:22	11:17	11:08	11:	11:04
106:58	117:43	129:02	142:32	152:03	163:38	175:03	186:26	198:08	211:21	222:56	234:27	246:03	257:29
12:06	10:45	11:19	13:30	9:31	10:35	11:25	11:13	11:42	13:13	11:35	11:31	11:36	11:26
102:18	113:43	125:10	136:32	149:17	160:41	176:28	191:34	203:03	214:43	227:51	241:04	252:27	264:08
11:10	11:25	11:27	11:22	12:45	11:24	15:47	15:06	11:29	11:40	13:08	13:13	11:23	11:41
103:25	114:23	125:34	139:23	157:36	168:42	179:46	191:09	206:38	218:02	231:27	242:34	253:38	264:33
15:26	10:58	11:11	13:49	18:13	11:06	11:04	11:23	15:29	11:24	13:25	11:07	11:04	10:55
102:12	120:12	131:35	142:50	154:10	165:35	176:52	188:11	201:43	216:42	229:32	241:09	255:04	266:47
13:05	18:	11:23	11:15	11:20	11:25	11:17	11:19	13:32	14:59	12:50	11:37	13:55	11:43
106:11	117:32	128:56	144:20	155:40	167:13	178:41	193:02	208:58	220:22	234:09	245:53	260:12	272:01
14:56	11:21	10:24	15:24	11:20	11:33	11:28	14:21	15:56	11:24	13:37	11:44	14:19	11:49
110:54	122:33	134:21	146:09	160:52	172:55	184:37	196:39	208:30	220:08	231:55	243:37	256:41	272:25
11:41	11:39	11:48	11:88	14:43	12:03	11:42	12:02	11:51	11:38	11:47	11:42	13:04	15:44
105:41	125:06	136:43	147:56	159:25	170:53	182:15	193:30	204:41	220:09	231:46	247:13	262:	273:34
11:19	19:25	11:37	11:13	11:29	11:28	11:22	11:15	11:11	15:28	11:37	15:27	14:47	11:34
102:32	117:20	128:35	146:10	162:24	176:04	187:27	202:17	215:44	227:03	238:32	252:51	265:17	277:33
13:49	15:48	11:15	17:35	16:14	13:40	11:23	14:50	13:27	11:19	11:29	14:19	12:26	12:16
108:45	120:30	132:10	148:47	163:25	179:01	191:12	203:13	215:23	227:20	239:36	253:32	265:36	
11:48	11:45	11:40	16:37	14:38	15:36	12:11	12:01	12:10	11:57	12:16	13:56	12:04	Running
111:40	124:21	136:09	147:28	159:08	173:21	189:20	200:59	212:19	223:30	242:15	253:58	267:39	
11:13	12:41	11:48	11:18	12:20	14:13	15:59	11:39	11:20	11:11	18:45	11:43	13:41	Running
132:55	144:08	155:34	166:54	178:15	189:30	200:49	212:15	223:57	238:49	250:10	261:30	273:	
11:10	11:13	11:26	11:20	11:21	11:15	11:19	11:26	11:42	14:52	11:21	11:20	11:30	Finished; no Time
131:26	146:04	158:06	175:41	187:17	204:32	216:15	228:14	239:58	251:50	263:30	275:14		
11:36	12:38	12:02	17:35	11:36	17:15	12:43	11:59	11:34	11:52	11:40	12:44	Running	
105:	116:19	127:33	138:54	150:19	164:41	176:04	187:27	198:55	213:53				
11:19	11:19	11:14	11:21	11:25	14:22	11:23	11:23	11:28	14:58	Steering Gear			
155:	166:53	178:41	190:32	208:05	220:32	232:53	245:41	257:29	269:31				
12:30	11:53	11:48	11:51	17:33	12:27	12:21	12:48	11:48	12:02	Early Carburetor Trouble			
110:13	153:45	165:23	193:	204:19	215:22	226:30	237:36	259:					
11:02	43:32	11:38	27:37	11:19	11:03	11:08	11:06	21:24	Running				
110:43	122:33	134:17	156:57	170:24	219:59	231:36	250:13	265:33					
14:42	11:50	11:44	22:40	13:27	49:35	11:37	18:37	15:20	Brake				
103:04	114:11	125:18	136:11	147:13	158:13	175:23							
19:19	11:07	11:07	10:53	11:02	11:00	17:10	Accident on Back Stretch						
201:40	213:46	225:55	242:15	254:53	267:11								
12:13	12:06	12:09	16:20	12:38	12:18	Broke Radius Rod in First Round							
164:23	175:40	186:41	197:43	209:02									
47:36	11:17	11:01	11:02	11:19	Broke Shaft								
110:37	123:04	134:05	170:24										
10:55	12:27	11:01	36:19	Carburetor									
97:01													
10:29	Radiator												
149:45													
12:08	Cooling System												

[Note—Black figures indicate leader on each lap.]

SUMMARY OF RESULTS IN THE WHEATLEY HILLS SWEEPSTAKES, WON BY THE FAL, AVERAGING 58.45 MILES AN HOUR

No.	Car	Driver and Mechanician	1st Lap 12.64 Miles	2nd Lap 25.28 Miles	3rd Lap 37.92 Miles	4th Lap 50.56 Miles	5th Lap 63.20 Miles	6th Lap 75.84 Miles	7th Lap 88.44 Miles	8th Lap 101.12 Miles	9th Lap 113.76 Miles	10thLap 126.40 Miles	11thLap 139.04 Miles	12thLap 151.68 Miles	13thLap 164.32 Miles	14thLap 176.96 Miles	15thLap 189.60 Miles
46	**Fal**	J. F. Galnaw	13:24	26:40	39:48	52:53	67:35	79:46	93:48	106:38	118:54	130:59	143:06	155:49	168:49	181:47	194:39
		L. Folman	13:24	13:16	13:08	13:05	14:42	12:11	14:02	12:50	12:16	12:05	12:07	12:43	13:	12:58	12:52
41	**Fal**	W. H. Pearce	12:34	24:53	37:21	49:51	62:25	75:06	87:41	100:23	113:01	125:37	147:49	161:42	175:37	191:59	205:01
		Frank O'Brien	12:34	12:19	12:28	12:30	12:34	12:41	12:35	12:42	12:38	12:36	12:12	13:53	13:55	16:22	13:02
45	**Marmon**	F. Heineman	12:01	23:48	35:33	47:16	59:30	71:28	93:18	108:	122:18	137:10	152:04	166:50	182:34	197:59	Run'g
		H. B. Patten	12:01	11:47	11:45	11:43	12:14	11:58	21:50	14:42	14:18	14:52	14:54	14:46	15:44	15:25	
42	**Mercer**	E. H. Sherwood	19:15	32:31	45:58	59:12	98:56	112:28	125:33	138:45	152:04	203:08	Running				
		H. M. Ozier	19:15	13:16	13:27	13:14	39:44	13:32	13:05	13:12	13:19	51:04					
49	**S. P. O.**	J. Juhasz	14:11	28:03	41:49	55:12	Engine trouble										
		Joe Melzer	14:11	13:52	13:46	13:23											
43	**Marion**	M. Basle	15:53	31:28	60:51	Carbureter											
		Herbert Bailey	15:53	15:35	29:23												
48	**Corbin**	A. Maisonville	12:04	Engine Trouble													
		A. C. Basdedissor	12:04														
47	**Mercer**	W. H. Fry	12:49	Hit Telegraph Pole on Second Lap													
		C. M. Kitrell	12:49														
44	**Correja**	W. H. Roberts	Disqualified by Technical Committee														
		H. Brasher															

officially left in the contest. No change in leading positions.

Lap 8—The first of the Marquette-Buicks went out in the eighth circuit when car No. 3, driven by Arthur Chevrolet, experienced trouble with its transmission and retired. Marquette-Buick 29 averaged nearly 74 miles an hour up to this point and was almost 7 minutes ahead of the Alco.

Lap 9—The heart-breaking speed at which the pacemaker had been driven from the start began to tell upon the car in this round, and at the tape it was found that it had not only lost the lead, but had fallen back to seventh place. The Alco showed prominently in the contest for the first time, finishing the round in third place, being led by Marquette-Buick 27 and Marmon 25.

Lap 10—One round proved enough for Marquette-Buick 27, which went out with radiator troubles. The Corbin contestant also dropped out with similar troubles, thus leaving 23 cars in the race. Marmon 25 assumed the lead by a wide margin, having over 4 minutes the advantage of National 31, which had been pushed forward rapidly by Disbrow. Marquette-Buick 29 was driven hard to make up lost distance and was in third place, less than 1-2 a minute behind the National. Lozier was fourth and Alco fifth, all within striking distance.

Lap 11—The Marmon increased its lead slightly in this round, gaining 35 seconds on the National and 15 seconds on the Marquette-Buick.

Lap 12—The leader made slow time in this circuit on account of tire changes, but at the tape the Marmon 25 still led by 48 seconds over the Marquette-Buick 29, which was bowling along desperately to get to the front. National 31 avoided the spurting and fell back into third place.

Lap 13—This proved to be one of the speediest of the whole race. National No. 10 made a wonderful rush, breaking all records for the course in 9:31. The Alco's driver took no chances, however, and made the round in 11:27.

Lap 14—The pace of the last lap proved to be the last straw for several of the competing cars, and at the conclusion of this round the steadily moving Alco had moved up to third position, behind National 31. Marquette-Buick 29 made slow time and was apparently out of it. In its fourteenth circuit Marmon 21 broke a shaft and went out.

Lap 15—National 31 fell back several pegs with a round in 15:47 and the Alco moved up to second place, 2:24 behind the Marmon. National 10 slipped into third position, about 3 minutes back of the final winner. The Simplex pair, who had been maintaining a steady, fast pace from the start, were closing in with Pope-Hartford 17 a few seconds back.

Lap 16—The Marquette-Buick found its finish in this lap through an accident on the back stretch, in which the car was practically demolished. National 10 narrowed the lead of its rivals a small shade in this round, but the relative positions were unchanged.

Lap 17—The Marmon, tin-canning along in front, apparently established a winning lead at the end of this round, gaining 1:36 on the Alco and 12 seconds on the National 10, which was close on the latter's heels.

Lap 18—The Marmon lost the cup and prize in this round through hitting a spectator and losing about 8 minutes in the circuit. When the contenders had slipped over the tape, the Alco was in front with a margin of 3:24 ahead of National 10, which was 33 seconds before the former leader.

Lap 19—Out in front for the first time, Grant took hold of his car and made the next lap in 12:54, allowing both the placed cars to crawl up close.

Lap 20—The Alco was driven fast in this lap to maintain its narrowing lead, but the little Marmon was shooting at the big black car and cut off 7 seconds of the margin that separated them. National 10 fell back into third place in this drive. The Marmon was only 2:13 behind at the tape and was going fast.

Lap 21—A tire change for the Alco practically wiped out its lead in the next to the last round, and the Marmon, running nearly as fast as it did in its best lap, cut another minute and 30 seconds from the lead.

Lap 22—Into the stretch 18 great road locomotives plunged for the final trial of speed in competition for the cup. In front was the black car that had made such a gallant fight. Its 6-cylindered engine was working like a watch; its pilot, whose great headwork had proved a big factor in the race, was as steady as his car. Next behind was the Marmon, and next came a National, then another National, a Lozier—all stock cars, the special racing machines having been eliminated for one cause or another, and they were hopelessly beaten at this stage.

National 10 was the first to appear at the head of the stretch, and Aitken shot over the line in 257:29. He had done the last lap in 11:26, and barring disaster to the leaders, this was not fast enough to win. Then came a pause of a few seconds and the Alco plunged over in 255:58, making the last lap in 11:22. If the Marmon could make the final round in 10:40, it would win. The seconds ticked off slowly in the Alco camp, but before the yellow jacket showed at the head of the stretch somebody threw his cap in the air and yelled triumphantly. Then the staunch Marmon appeared and flashed past, but it was almost 25 seconds too late to gain first honors.

"Among Those Present"

W. C. Durant, of the General Motors Company, proved a life saver to some members of the press. Mr. Durant furnished them with a Welch-Detroit which was used in preliminary work.

The Pope-Hartford contingent was down from Hartford en masse. Among others there were Colonel George Pope, C. H. Gillett and Harold Pope.

J. D. Fulton, of the *Record-Herald*, and Joseph E. G. Ryan, of the *Inter Ocean*, were among the Chicago delegation.

James Evans, advertising manager of the Brush Runabout Company, came in from Detroit on Friday.

F. E. Dayton and H. V. Nuckols headed the Columbiaites.

Harry Field, of the Hartford Rubber Works, was among the interested spectators.

Mr. Brand, of the Parish Steel Company, of Reading, Pa., was present.

Orlando Weber, of the Chicago Palmer & Singer branch, with Mr. Singer, was on the track from an early hour.

C. G. Bleasdall, manager of the Maxwell-Briscoe-Cleveland Company, was a guest of Messrs. Briscoe and Maxwell.

Frank Briscoe, of the Brush Runabout Company and the Briscoe Manufacturing Company, with his family and some friends also occupied a box.

Howard Marmon was in charge of the Marmon pit. Howard prefers to be in the midst of the battle.

Harry Strong, president of the Rochester Automobile Club, who has lately gone into the automobile industry, drove down.

Charles L. Stevens, formerly with the Los Angeles Motordrome, was quartered at the Garden City Hotel.

William J. Lasher, well known in New York trade circles, announced prior to the race that he had assumed charge of the Hartford branch of Carl H. Page & Company.

William J. Coghlan, manager of the Chadwick Engineering Works, Philadelphia Branch, was one of the interested visitors.

John N. Willys, president of the Willys-Overland Company, was a keenly interested spectator.

H. A. Wilcox, manager of the Kelly Motor Truck Comapny, of Sprngfield, O., saw the race.

Inadvertently Let Cat Out of the Bag

Les vaincus, ce ne sont pas ceux qui ont couru, mais ceux qui se sont abstenus.—*La Vie Automobile*, Sept. 24, on results of "La Coupe des Voiturettes."

(Translation):

The conquered are not those who raced but those who held aloof.

This is one of the points that was plainly brought out in the Vanderbilt race—foreign automobiles were few and far between.

Short News From Everywhere

ITEMS CULLED HERE AND THERE FOR QUICK READING—TRADE AND GENERAL INFORMATION

—W. A. Logan has recently been added to the sales force of the Cleveland Rauch & Lang Co.

—George L. Schofield has been made general manager of the Elkhart Motor Car Company, succeeding John T. Knott.

—E. Winkes, formerly with the Cleveland Rambler branch, has accepted a position with the firm selling Maxwell and Columbia cars.

—The Halladay line, consisting of sixteen models, will be handled on the Pacific Coast by the Halladay Motor Car Company at Los Angeles.

—Hughson & Merton, Pacific Coast representatives of Ajax tires, have moved into a new store in Seattle, Wash., corner Pike street and 10th avenue.

—The Cleveland Electrical Repairing Company has opened a storeroom at 2025 East 22d street. Manager F. H. Clark was manager at the Peerless factory for six years.

—The Maxwell entry was awarded the reliability cup in the second annual contest of the Louisville Automobile Club. A Cole "30" proved winner in the economy division.

—Announcement has been made by S. F. Edge, Ltd., of London, that the company's exhibit of two Napier six-cylinder cars had been awarded the Grand Prix at the Brussels Exhibition.

—The Vail Motor Car Company, agent for the Empire and Clark lines, has purchased the Raymond garage on Carnegie avenue, where it will continue the garage and add a large repair and machine shop.

—S. A. Zapp has purchased the Lawrence Garage at 124 E. Fourth street, Fremont, Neb. The Overland agency will be continued and another line added. Supplies and accessories and a well equipped repair shop will be maintained.

—F. E. McClure, manager of the branch house that will be opened by the Brush factory this week, will also handle the Alden-Sampson truck. McClure has already began to make arrangements for salesrooms and northern Ohio agencies.

—At a meeting of the Board of Governors of the Columbus (Ohio) Automobile Club Dr. Walter E. Ranchous was elected secretary to fill the vacancy caused by the resignation of Arthur M. Crumrine and Frank McMakin was elected assistant secretary.

—J. B. Sperry, well known in Cleveland automobile circles, agent for the Henry car, has been appointed manager of the Warren Auto Sales Company, the Cleveland branch house for Warren-Detroit cars. Three hundred cars have been allotted Cleveland and northern Ohio.

—Dr. A. T. Lawless, of Syracuse, won the Syracuse *Herald's* second annual sociability run to Renwick Falls and return last week with a Maxwell car. Three other prizes were awarded for finishing the course close to the secret time. This is the second time Dr. Lawless has won the cup.

—The Cartercar Company has completed arrangements for opening a branch in Chicago. A lease has been closed for a handsome showroom at 324 Michigan avenue. Charles E. Hammerly, who has had the agency for the Cartercar for many years in Chicago, and owns a garage at Harrison and Oakley boulevards, has been named as branch manager.

—The Columbus Buggy Company of Columbus, Ohio, is sending out catalogs showing the various models made by the company for 1911. Photographs of the 10 models of gasoline cars are shown and the distinguishing features are explained in full.

—On the point of going to press it is reported by wire from Detroit, Mich., that the E-M-F Co. has dropped the prices of its 30-horsepower E-M-F from $1,250 to $1,000 and the 20-horsepower Flanders from $750 to $700. The reasons attributed for these reductions are improved facilities of manufacture and reduced cost of materials owing to the purchase thereof of large quantities.

—President Walker, of the Lorraine Motor Company, has closed a contract with the Philadelphia Housewrecking Company for the clearing of a large plot at Thirty-seventh and Ludlow streets, upon which a model garage will immediately be erected. All the appurtenances of a first-class club will be included in the equipment of the second floor, which will include apartments fitted up for ladies on one side of the new building, a suite of rooms for men on the opposite side, and a reception room leading to the main floor. Eighty cars will be stored in the building. A large machine shop equipped for heavy automobile work will be one of the features of the plant. In this field the Pierce-Racine and the Allen-Kingston are the cars which the Lorraine Motor Company will handle. The officers of the company are: W. L. Walker, president; Joseph Booth, vice-president; E. More, treasurer; J. L. Larsen, Dr. Ruel Stewart, Joseph Booth, George T. Cutler and W. L. Walker, directors.

Great Western Has New Home in Boston

The illustrations here given are of the new garage which was just completed by the Castle Square Garage Co., Boston, Mass. It is an L-shaped building fronting upon Ferdinand street, running through to Edgeley street. The group of illustrations show the front and rear façades and two interior views. As will be observed the building is of concrete construction faced with brick, and besides affording a large floor space entirely devoid of obstructions the building is light and is fitted out with every convenience, including three turntables, wash racks with hot and cold water, and a place for everything. The Great Western "40" is all that will be handled at this establishment and the sales rooms are so arranged that the cars may be examined closely by the clientèle of the company.

New Castle Square Garage, Boston, Mass. The home of the Great Western "40"—It is a fire-proof building with every convenience and has well-appointed salesrooms

Prominent Automobile Accessories

ACETYLENE STORAGE AND TRANSPORT

Among high powerful illuminants that are easy to handle and relatively cheap and portable acetylene gas certainly holds its own. Generators for direct gas production on the car or boat are extremely useful, but have their drawbacks owing to the necessity of recharging frequently unless they are bulky and cumbersome. There is also to be taken into consideration the storage of loose carbide and the chance of clogging and stopping of the water flow.

In order to obviate these small inconveniences much attention has been paid to dissolved acetylene put up in cylinders that are easy to handle besides being clean. The difficulties attending the compression of the gas into containers, due to the peculiar chemical character of acetylene, at the outset caused several failures. When certain temperatures and pressure limits are exceeded spontaneous decomposition takes place.

It is necessary to dissolve the gas in suitable organic solvents of the highest purity held in containers packed with porous material in such a way that no pockets can form inside.

Fig. 1—New tire pressure gauge

A convenient and safe method of carrying acetylene gas has been placed on the market by the Searchlight Gas Co., of Pittsburg, Pa., and Warren, Ohio. The cylinders used are stamped from high-grade steel and measure 22 inches long and 6 inches in diameter, when finished. Protection from blows is well guarded against by placing the gauge, valve, safety plug and safety diaphragm entirely within the recess shown in Fig. 4, which also shows the compactness of the whole apparatus. The head is fitted after the porous filling has been inserted and carefully brazed, insuring the absence of all leaks. The strength of the cylinder is several times the pressure at which it is fully charged.

Fig. 2—New tool for valve-grinding

In Fig. 3 a fusing plug is fitted "E" which melts at a very low temperature, allowing a gradual release of pressure in case the tank comes in contact with great heat. In case of accident the safety diaphragm D releases at 400 pounds pressure.

HANDY TIRE PRESSURE GAUGE

Sufficient stress cannot be laid upon the necessity of owners to see that the correct pressure is maintained in the tires and to do this it is essential to have a gauge that correctly registers this pressure. In the Brown Tire Pressure Tester, made by the Brown Co., Syracuse, N. Y., it is possible to ascertain the amount of pressure the tire contains by removing the valve dust cap and firmly pressing the tester on the nipple. Two hands are fitted, one to register all pressures and this carries with it another hand to register the maximum amount in the tire; this latter hand is red and remains at the maximum point of pressure, enabling the reading to be taken after gauge has been removed from the tire.

VALVE GRINDING TOOL

Motorists can save themselves money in the long run if they provide their men with a few extra tools to render certain operations on the car easier. One duty that the man often shirks is the regular grinding of valves. A device that permits the merest tyro to effect the operation as well as the experienced mechanic will be found in the valve-grinding tool here shown. It is made by the Brown Company, of Syracuse, N. Y.

NON-CORROSIVE BURNER SUBSTANCE

Next to a good automobile comes the question of lighting, for then the car is capable of affording a double time of service, since it will be available for use in the night time as well as during broad daylight. Autoists of experience have struggled with the problems of illumination, and acetylene has proven to be of great efficacy, despite the little drawbacks that attend its use. One of the real advances in the direction of the perfection of acetylene lighting comes in the form of Nuremberg Steatite, which is the material used in Alco Burners, one of which is here illustrated. It is of course true that the scientific shape of the burner has much to do with the excellent service it renders, but it is a property of this steatite to serve for a long time without choking up, and it is claimed that the real secret attending this latter consideration lies in the non-corrosive qualities of the steatite. These burners are made in many varieties to suit the several conditions, but the particular one here illustrated is known as the "Hilo-de-luxe," the price of which is 40 cents per burner. This burner is made by the American Lava Co., of Chattanooga, Tenn.

Fig. 3—The Alco Acetylene burner, "Hilo-de-luxe"

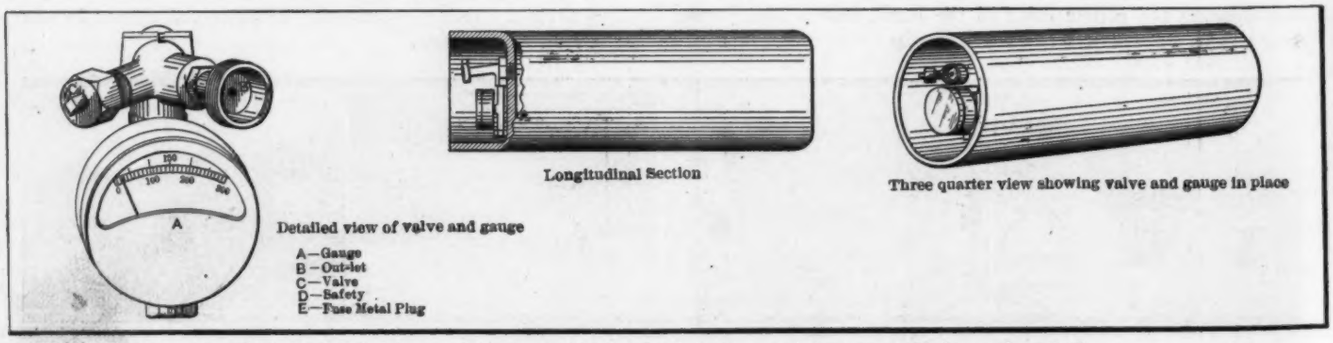

Fig. 4—Three views of the Searchlight Gas Co.'s new acetylene gas cylinder and control

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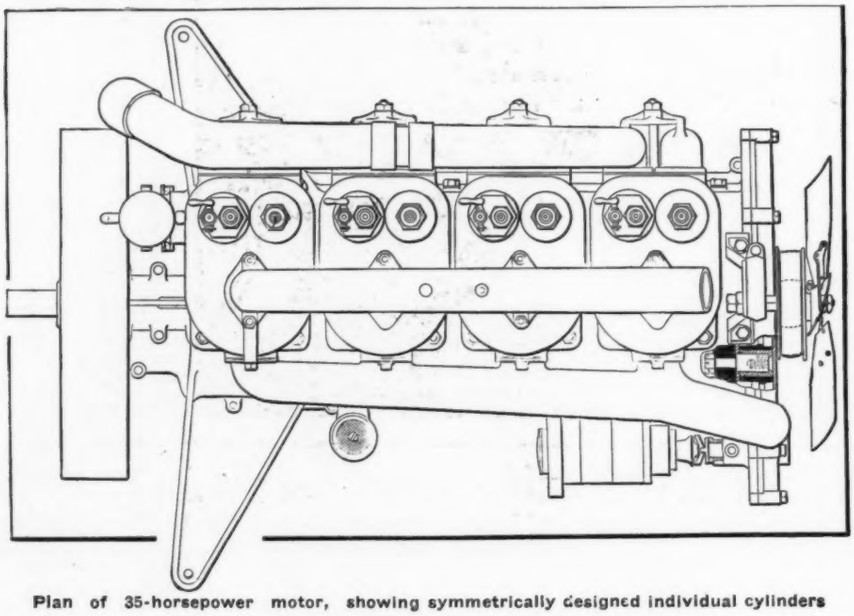
"The truth, the whole truth and nothing but the truth" —— J. N. Willys

Overland

PRODUCTION must be gauged as to its value, depending upon the methods employed. In experimental plants, for illustration, the output is limited to a single model; it is whittled out by a slow and laborious process; it represents, when completed, a more or less imperfect crystallization of the half-baked ideas of the inventor, who hopes by thus proceeding to make one more progressive step in the direction of perfection, realizing all the while that his own ideas are incoherent and his plans incomplete, and the workmen who undertake the task under such conditions, having no facilities but their bare hands and the class of machine tools that are used in general machining work, will be quite content if the automobile will run at all.

AFTER the completion of the first model of a car, despite the fact that the soul of the inventor is spread thinly over its working parts, it takes but a few moments for the man who pays the bill to arrive at the sane conclusion that he has put up a lot of money and received in return an ill-contrived mess that is rendered the more conspicuous by the noise it makes when it does run —granting that it will run at all. There are too many automobilists who are able to testify, as a matter of personal knowledge, to the facts as herein set forth. They are able to say that when the man who pays the bill finds himself the possessor of an aggregation of noise and confusion, he promptly transfers the obligation to one of P. T. Barnum's old and respected friends—Barnum having proved that "there is a sucker born every minute."

FIRST models, under the circumstances, must not be regarded as efficacious for exacting work. The next step in the evolution of an automobile comes as a revision of the first model; were it listed as an eatable it would be called "hash." Those who have patiently supported the automobile industry from the start, and who purchased their experience with real money, will appreciate just what this means, and they will understand that safety lies in the selection of perfected automobiles.



Plan of 35-horsepower motor, showing symmetrically designed individual cylinders

AFTER progressing thus far, the builder of cars on this plan is confronted by the unpleasant knowledge that he cannot build anything unless he first provides the requisite facilities. The chances are that his lack of experience will not permit him to intelligently select the facilities, and his first attempt in this direction will parallel his first effort as represented in the building of the model car.

PERHAPS the unfortunate would-be builder of automobiles, when he reaches this point, strikes a balance and locates a shortage that makes heavy inroads into a half-million dollars. In recounting his experiences, as he mourns his loss, he is not likely to forget that his customers are sharing his misfortunes; he loses real money, and they acquire junk at a cost.

THERE is nothing to suggest real production in the plan as above outlined. No part of such an effort is likely to lead to the goal of standardization, and, unfortunately, the builder suffers quite as severely as the purchaser of the ill-contrived product; they are both the victims of ignorance goaded on by enthusiasm, with no limit from the maker's point of view until he reaches the end of his credit; and as for the purchaser, he buys experience.

SUCCESSFUL manufacturers are those who have passed beyond this experimental stage—those who have dealt honestly

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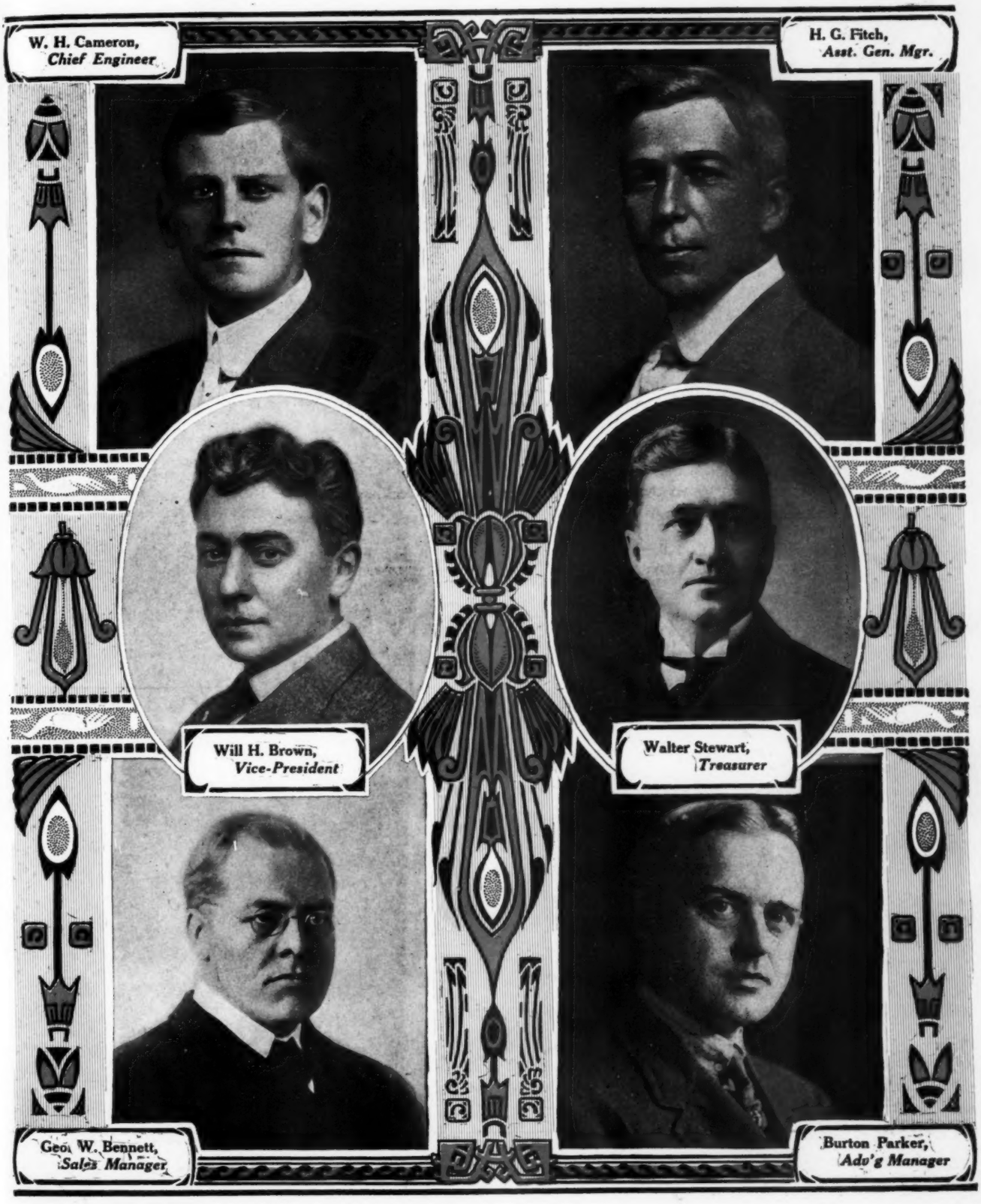
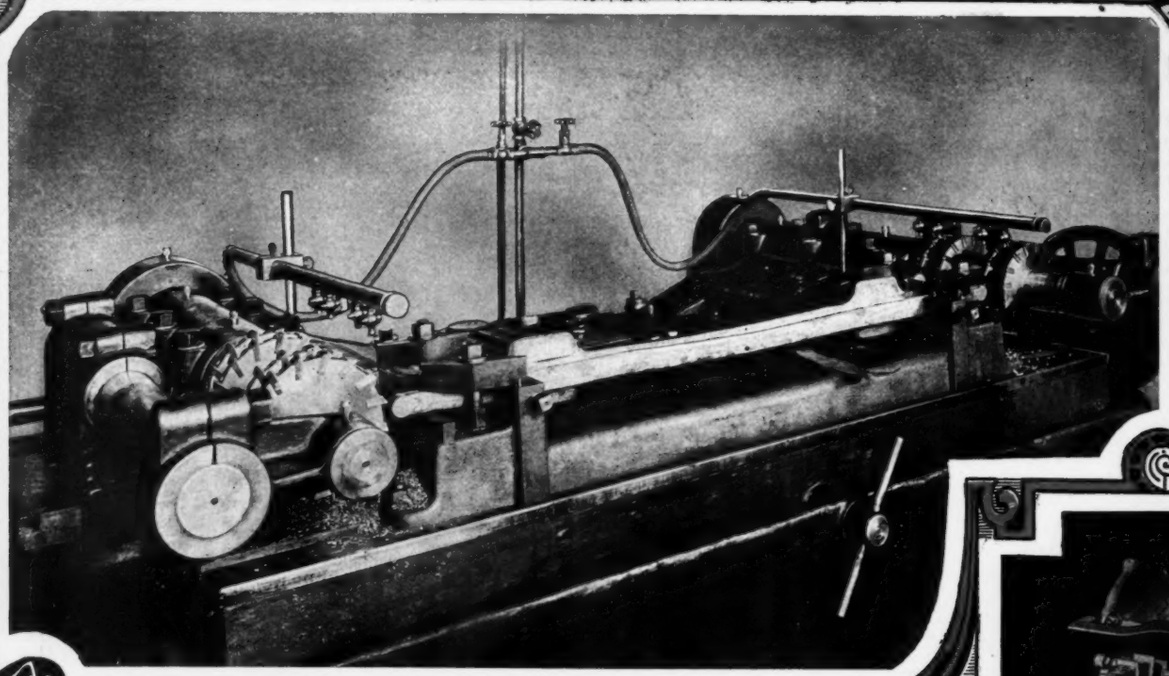
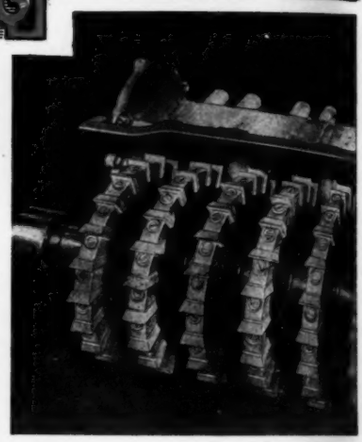

W. H. Cameron,
Chief Engineer
H. G. Fitch,
Asst. Gen. Mgr.
Will H. Brown,
Vice-President
Walter Stewart,
Treasurer
Geo. W. Bennett,
Sales Manager
Burton Parker,
Adv'g Manager

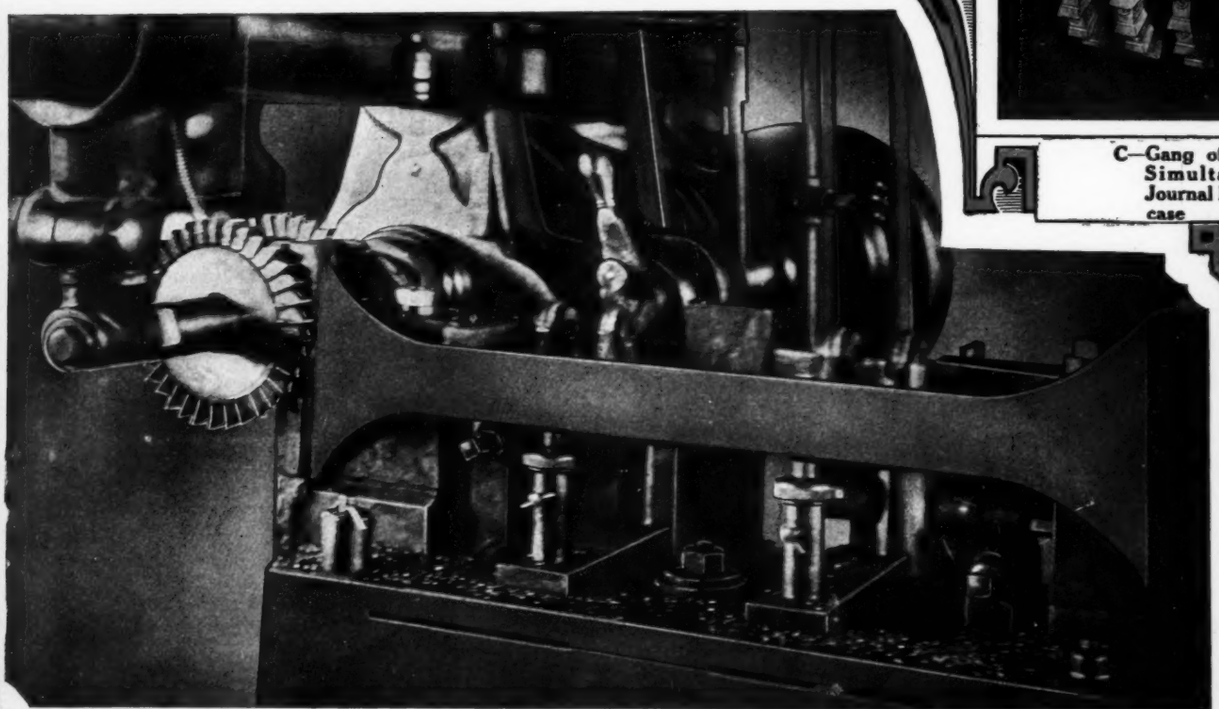
Plate I—Gang Milling Processes Utilizing Inserted Tooth Cutters



A—Special Steel I-section Front Axle Clamped to the Platen of a Double-Headed Multiple Cutter Milling Machine Milling all Faces at one Setting

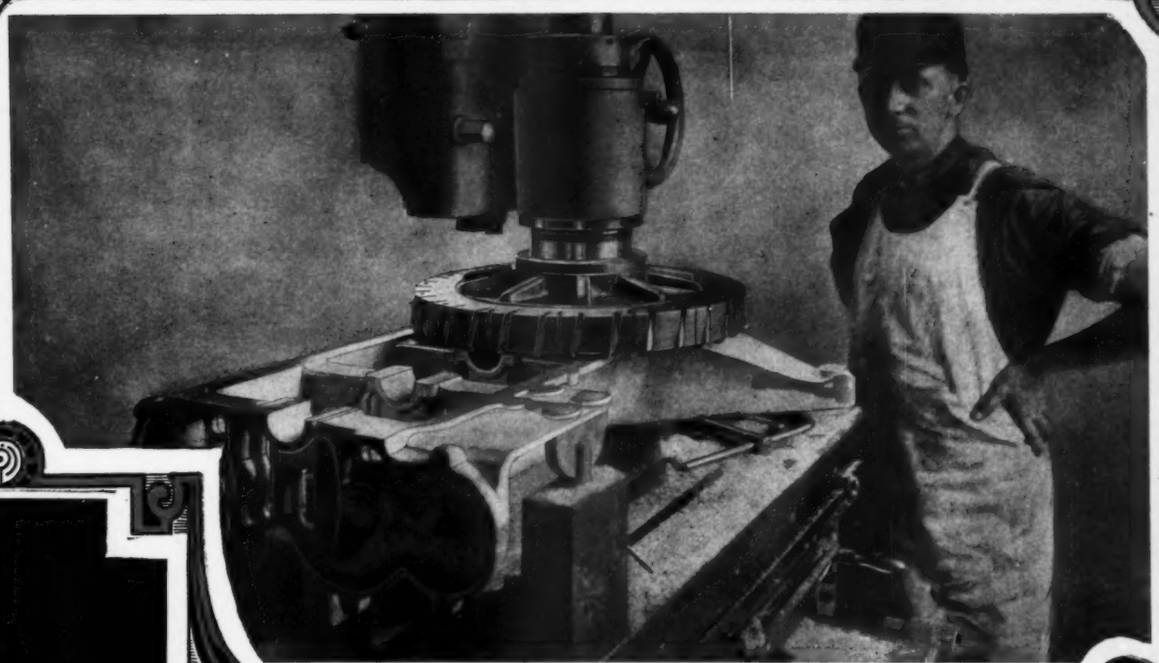


C—Gang of Inserted Tooth Cutters Simultaneously Milling Journal Boxes in a Malleable Iron Case



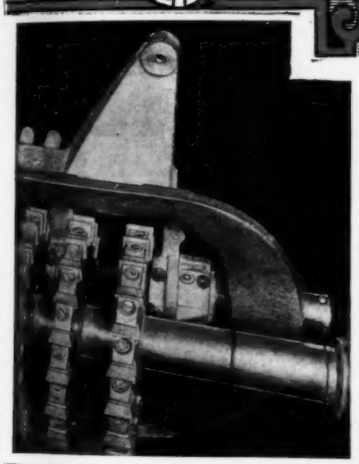
B—Example of a Milling Machine Equipped with Straddle Mills Facing the Compound Cross Member in one Operation, Feeding the Work Vertically Against the Cutters

Under Conditions of Terrific Speed and Great Accuracy

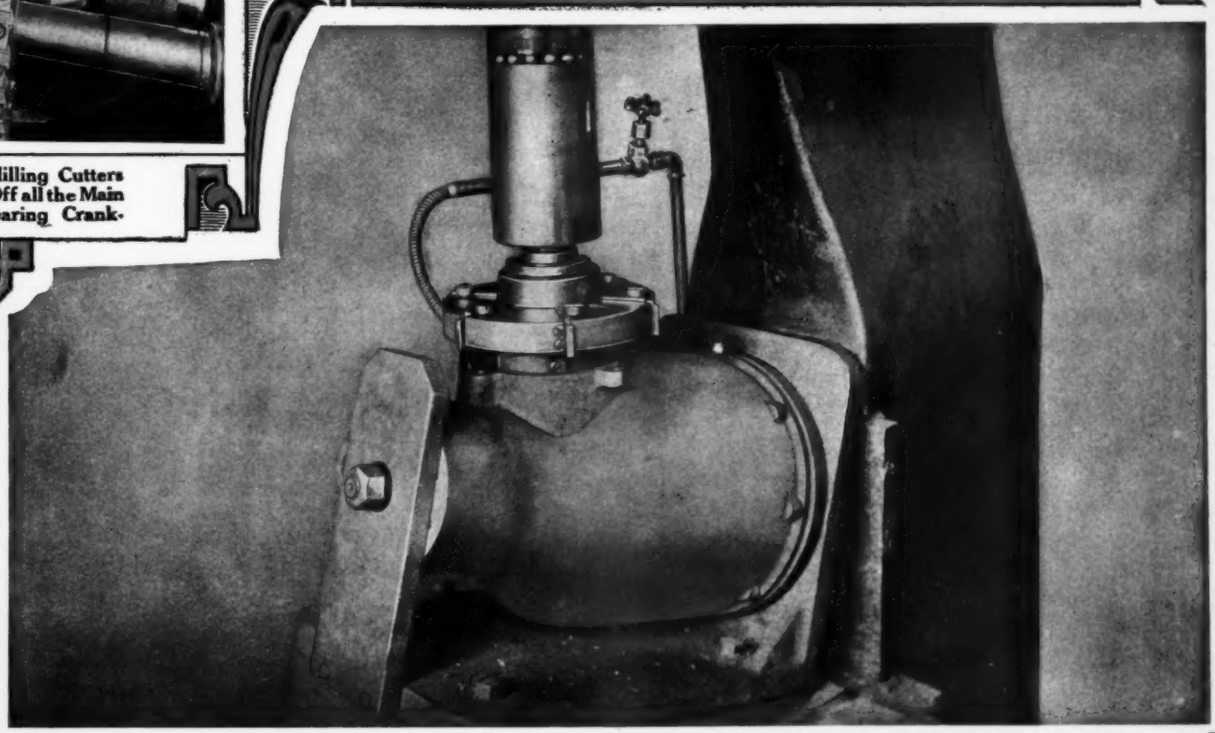


D—Ponderous Inserted Tooth Cat-head in a Vertical Mill Facing off the Aluminum Crankcase at High Speed Down to Scraping Size in a Single Operation

Overland



Tooth Milling Cutters Facing Off all the Main Five Bearing Crank-



E—Example of Milling Work Using an Angle Plate Fixture and an Inserted Tooth Compound Milling Cutter Boring and Facing the Hand-hole in a Planetary Gear Housing in One Operation

Overland

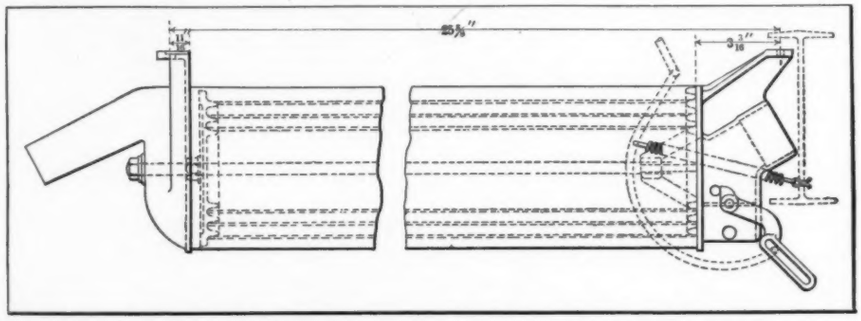
with themselves, hence honestly with their customers, and have made the fight along constructive lines, finally arriving at the only conclusion that can be reached in the long run, i.e., good automobiles emanate from the laboratory as a basis for action, and are definitely designed under the direction of a chief engineer aided by an efficient corps of assistants.

BUT engineers do not build automobiles; they merely design them. When it comes to the production in fact, there are special tools and facilities, as plans, patterns, templets, gauges, and instruments of precision, with buildings in which to place them, and an organization that is capable of directing their use, all to be provided and at a cost that would stagger the purchaser were the output limited to a single car. Even an output of 1,000 cars per annum offers but slight encouragement.

JUST to show that absolutely first-class automobiles cannot be designed and constructed excepting in large quantities, the following approximation of some of the items of fixed cost is offered·

Cost of drawings for a single model	$6,000
Cost of patterns for a single model	24,000
Cost of jigs and fixtures for a single model	50,000
Cost of special machine tools for the work	50,000
Laboratory expenses incurred in investigating	8,000
Miscellaneous expenses, as fitting out in the foundry, dies for drop-forging work, and the hundred and one other small items that must be included	20,000
Total	$158,000

These are good average results that cannot be bettered in a plant that is noted for absolutely interchangeable work.



Section of the silent muffler showing symmetrical design and method of fastening same to the chassis frame

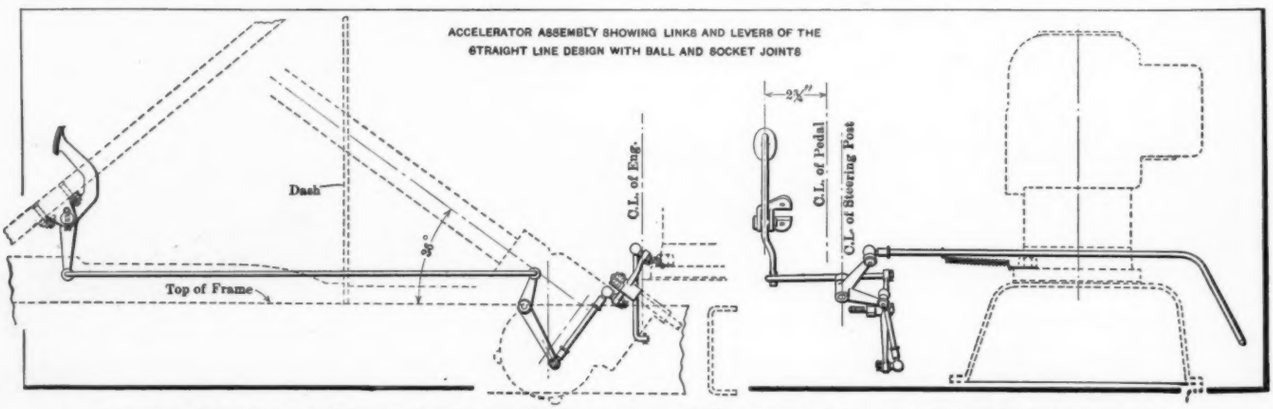
WHAT do these figures portray? Remember, there is no automobile represented in $158,000 worth of cost; there are no buildings in which to house the machinery; there are no officers and men to direct the work; there is nothing, in fact, but the list of special things that must be had before the most skilled men in the world will be able to build a car that will come up to standard.

DOES it not mean that the fixed charges which must be added to the cost of every car made will be on a basis as follows:

For an output of 1 automobile	$158,000.00
For an output of 100 automobiles	1,580.00
For an output of 1,000 automobiles	158.00
For an output of 10,000 automobiles	15.80

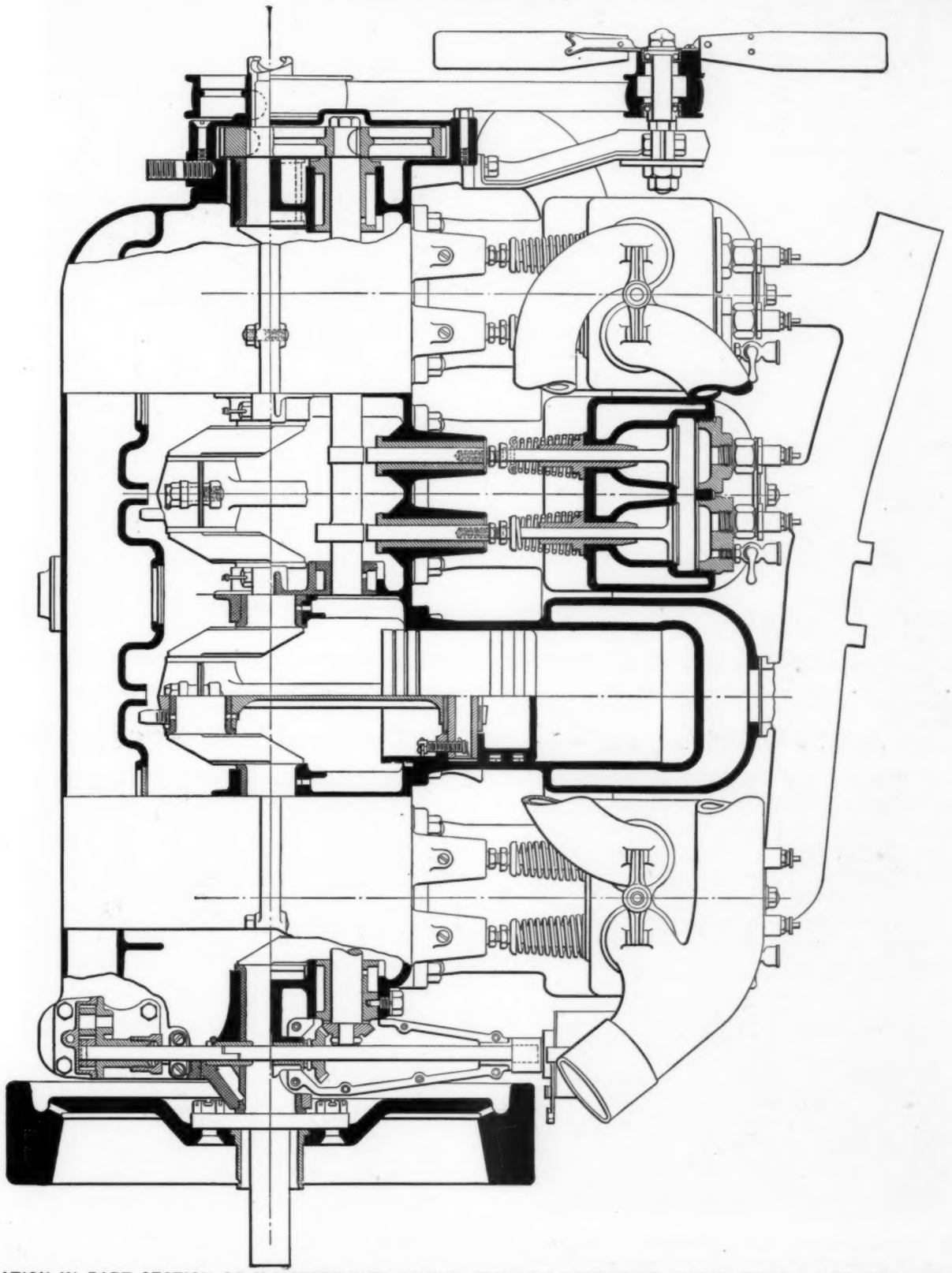
IS it not plain, with no chance of mistake from any quarter whatsoever, that the enormous cost for special tools and facilities will be just as high if one car is built as it will be if 10,000 automobiles are made? Is there any way by which a $50,000-a-year advertising man, with his splendid array of glittering generalities, can get away from the fact that the fixed charges for each automobile made can only be reduced if the total number of cars is increased?

IS there any sense in listening to the explanations of the builder who says he can do accurate and interchangeable work without these costly facilities? Is


ACCELERATOR ASSEMBLY SHOWING LINKS AND LEVERS OF THE STRAIGHT LINE DESIGN WITH BALL AND SOCKET JOINTS
Dash
Top of Frame
30°
C.L. of Eng.
C.L. of Pedal
C.L. of Steering Post

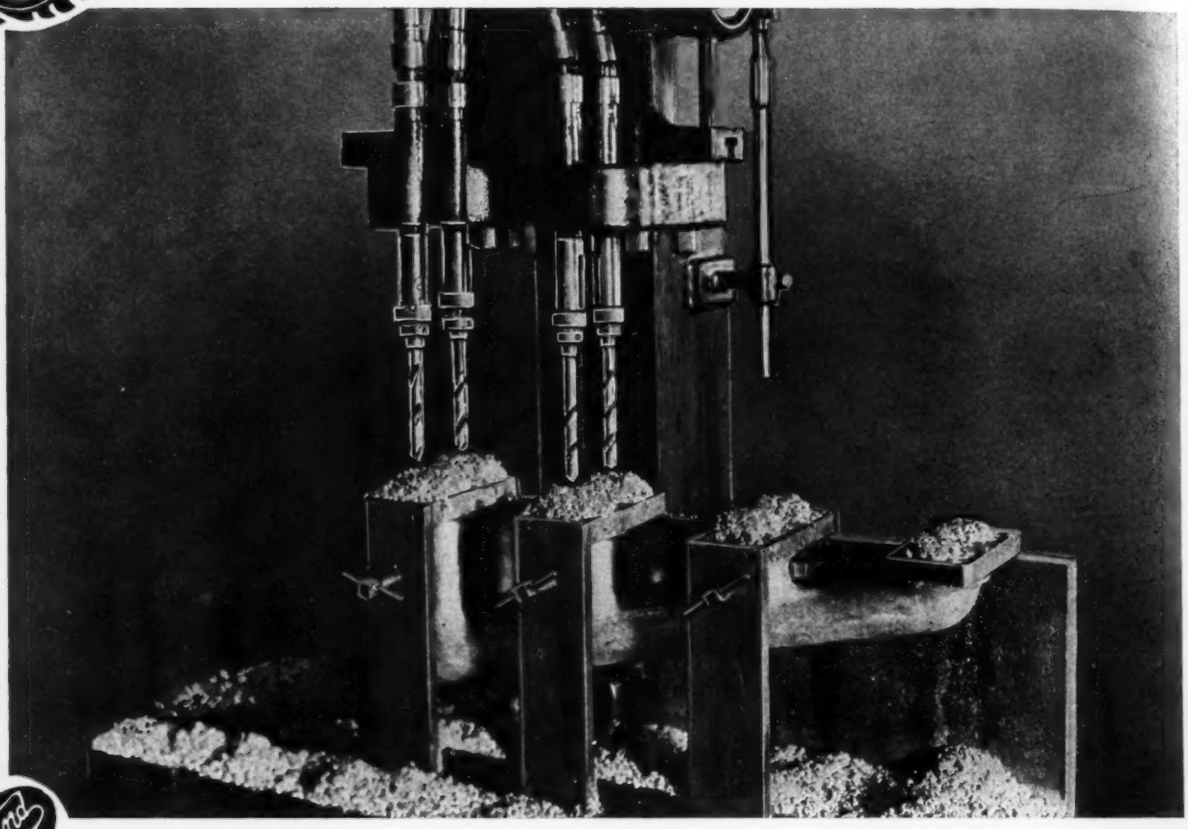
Lay-out of the links and levers for the accelerator, showing ball and socket joints and straight line movements

Overland

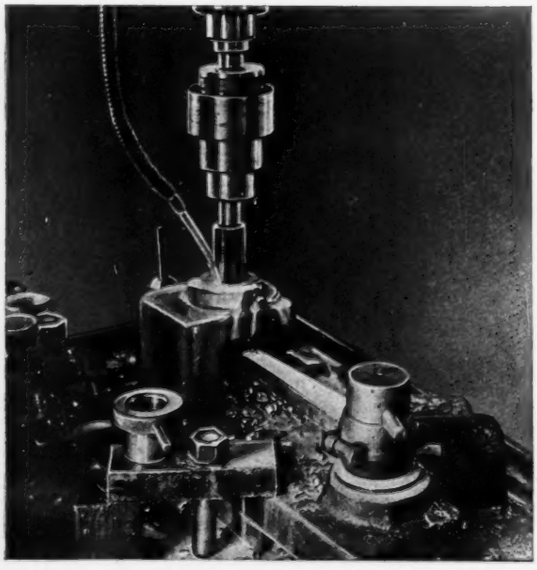


ELEVATION IN PART SECTION OF 35-HORSEPOWER MOTOR, SHOWING PERFECTED OILING SYSTEM AND MANY REFINEMENTS

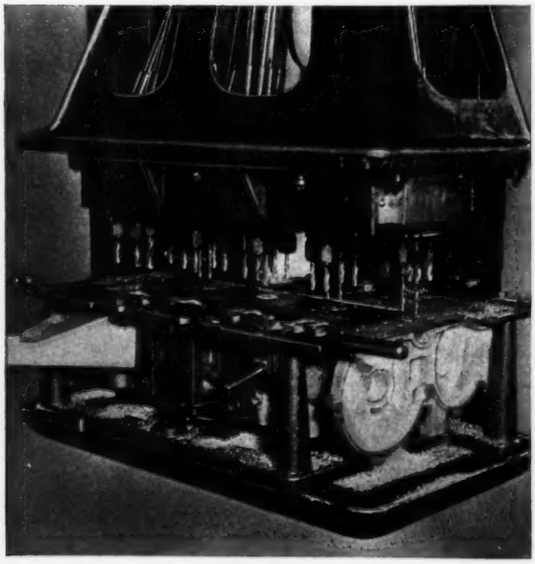
Plate II—Examples of Multiple Spindle Drill Work



A—Water Manifold Set Up in Angle Plate Fixture Equipped With Jig Plates so That all the Flange Holes are Drilled to Accuracy by a Multiple Spindle Drill

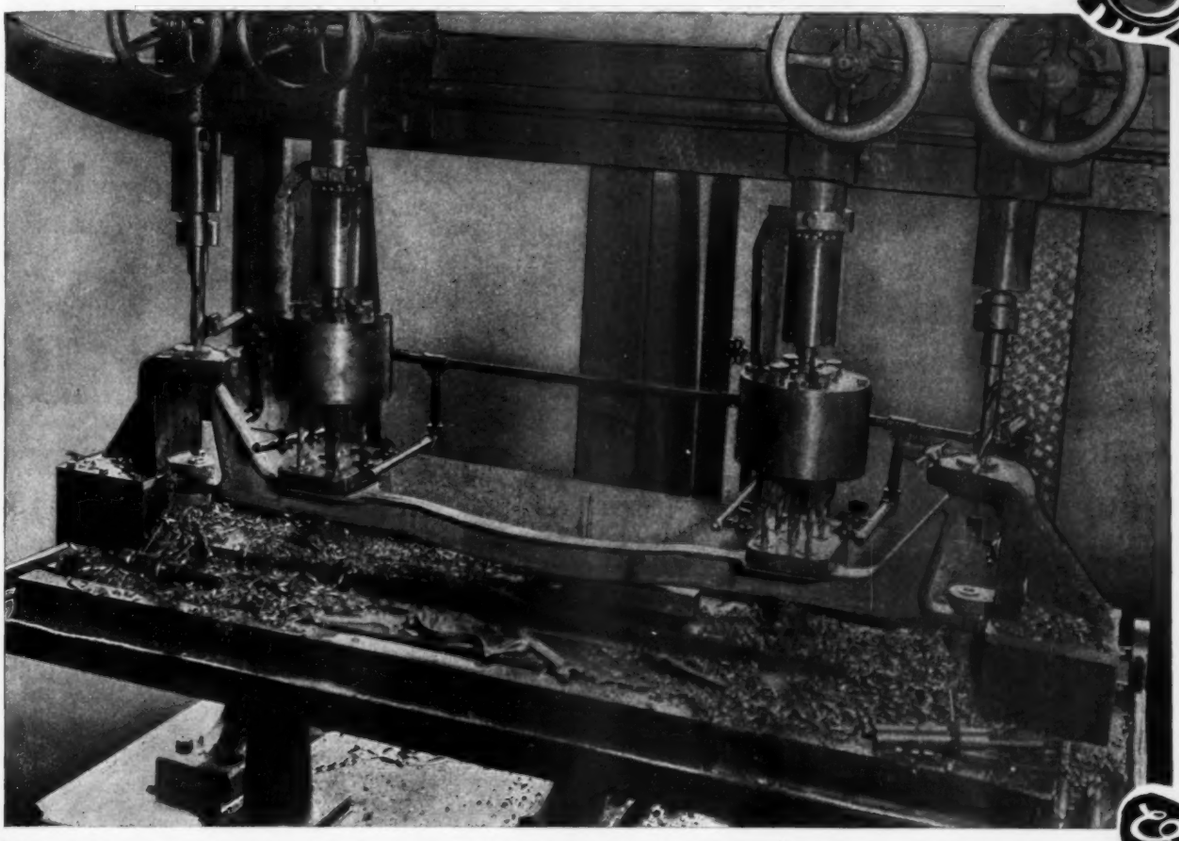


B—Connecting Rod Mounted in a Fixture on the Platen of a Power Reamer Having the Piston Pin End Reamed to Exact Diameter.

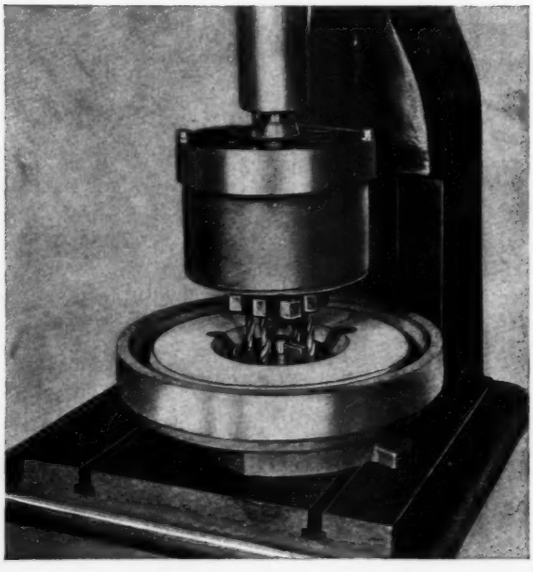


C—Crank Case on the Platen of a Thirty-two Spindle Drill Using a Jigging Fixture Having All the Holes Drilled at One Time.

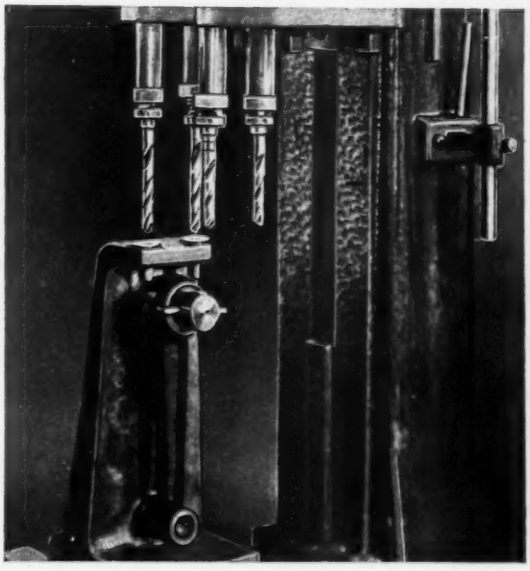
Used in Conjunction with Special Jigging Facilities



D—Special Steel I-section Front Axle Held in a Fixture on the Platen of a Multiple Spindle Drill Combining Cluster Boxes on Two of the Spindles Drilling all the Holes in the Axle at One Time



E—Convincing Example of the Cluster Box Idea in Which the six Flange Bolt Holes of the Flywheel are Drilled Simultaneously, Using a Single Spindle Drill Press for the Purpose



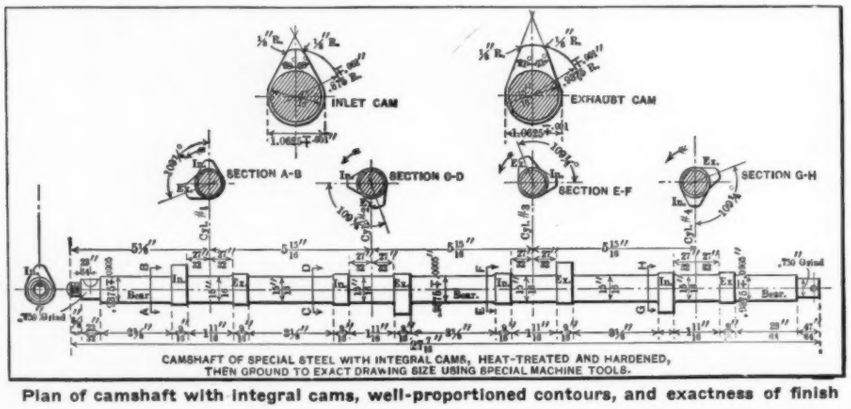
F—Depicting a Connecting Rod in a Fixture Having the Holes for the Holding Bolts Drilled, Using a Multiple Spindle Drill

Overland

he not trying to substitute cheap cleverness for necessary cost? Is it not true that it is cheaper for him to pay $50,000 a year for a man to write his advertising copy than it is to pay $158,000 for special tools, by means of which he could build a car so good that he would not be afraid to make a show-down?

WOULD a business man be able to keep outside of a lunatic asylum were he to expend $158,000 for special tools for which he would have no use? Would his confreres in business permit him to make this enormous expenditure were they not convinced of the necessity for so doing? Could the entire engineering world be wrong about this matter? Don't forget that they all, without exception, advocate the necessary first cost to bring about standardization, the duplication of parts, and the suppression of the personal equation in the shop.

NATURE breeds variety. No two blades of grass are alike; no two men were ever known to be exact duplicates of each other. Criminals are identified with absolute certainty by the Bertillon system; this is but another way of saying that the imprints made by the cuticle at the tips of the fingers of no two individuals are identical. And when the gamut is run the conclusion must be reached that standardization of product in a shop is utterly impossible unless the personal equation is done away with, and the men who perform the operations are so guided by jigs and fixtures that they cannot introduce their own ideas, even should they be inclined to do so.

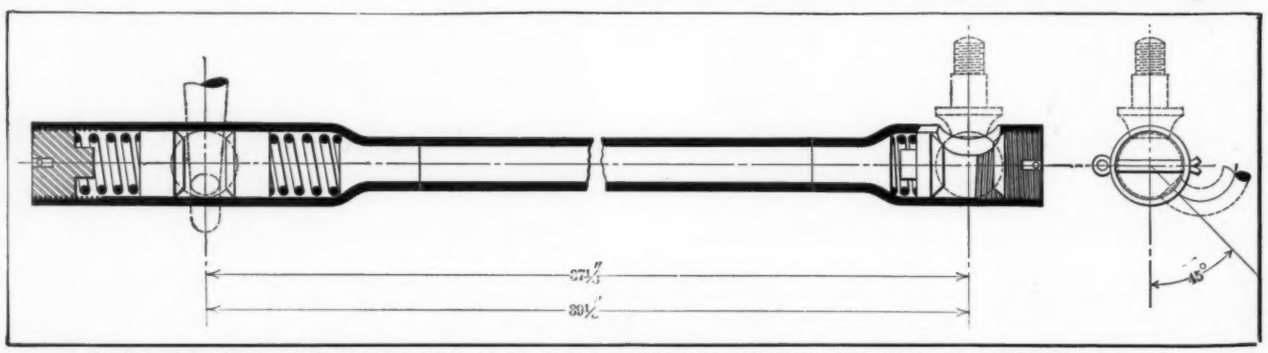

INLET CAM
EXHAUST CAM
SECTION A-B
SECTION C-D
SECTION E-F
SECTION G-H
CAMSHAFT OF SPECIAL STEEL WITH INTEGRAL CAMS, HEAT-TREATED AND HARDENED, THEN GROUND TO EXACT DRAWING SIZE USING SPECIAL MACHINE TOOLS.

Plan of camshaft with integral cams, well-proportioned contours, and exactness of finish

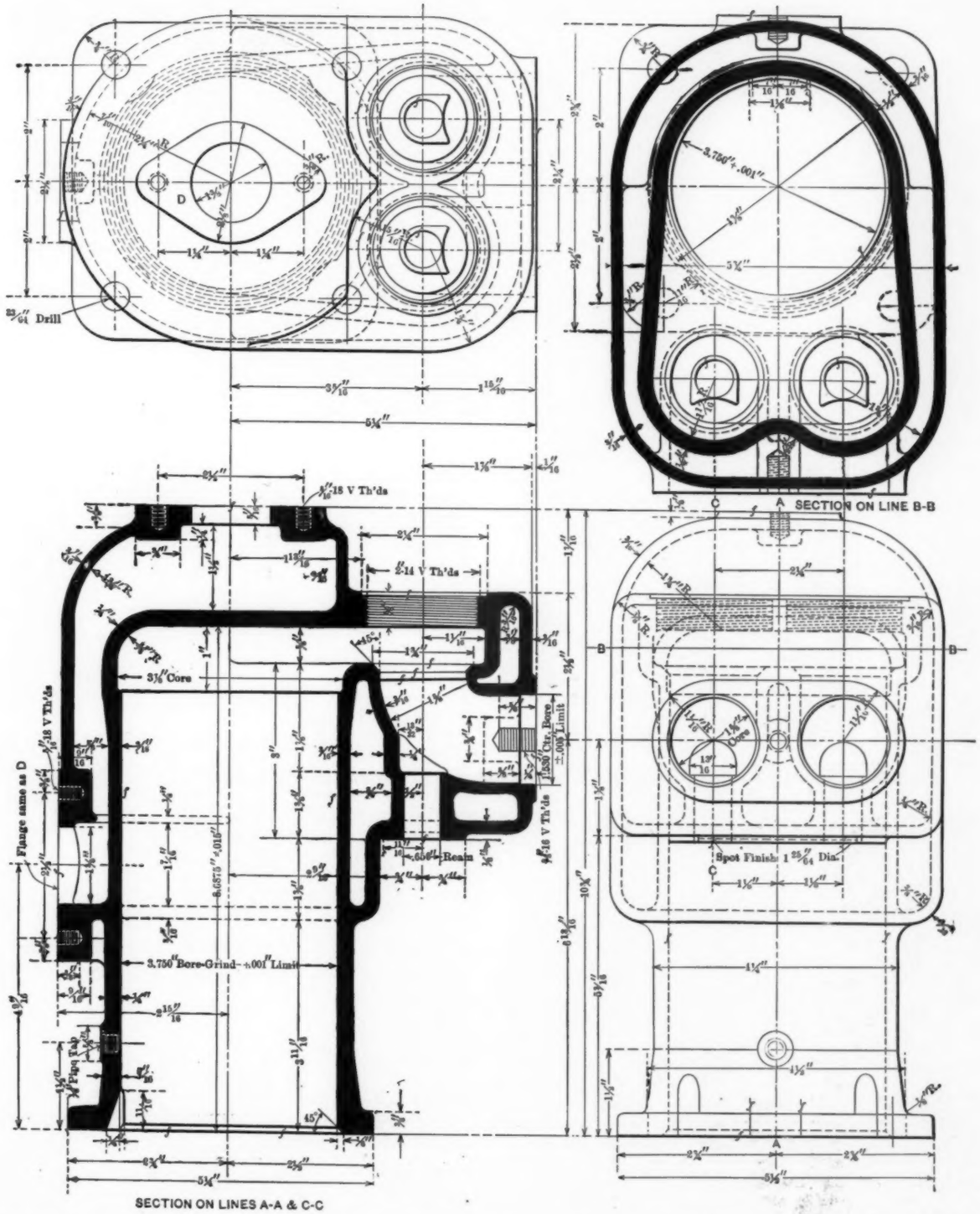
IN a word, it costs $158,000 per model to guide the workmen in the path of standardization—that is to say, to prevent them from introducing the variations that would surely come were they permitted to exercise their own judgment. In the earlier efforts along automobile lines, every maker was compelled to rely upon the skill of his men. There were no machine tools available such as would satisfy a more exacting situation; it was impossible to find a market for all the automobiles that would have to be made in order to limit the fixed charges to a reasonable sum, doing the work with jigs and fixtures as guides, thus excluding the vagaries of the workman.

REMEMBERING that the recommendations of the great engineering societies of the world are absolutely in favor of standardization at whatever cost, not forgetting that all the good automobiles that can now be had from any source whatever are built in shops that are fitted out with this costly equipment, what faith can be put in the statements of the assemblers of aggregations of materials that go into cars, when they say that there is no occasion for incurring so large a cost and going to so much trouble?

PERHAPS these assemblers have more faith in their ability to advertise money out of a purchaser's pocket than they have money with which to buy the necessary facilities to build a good au-

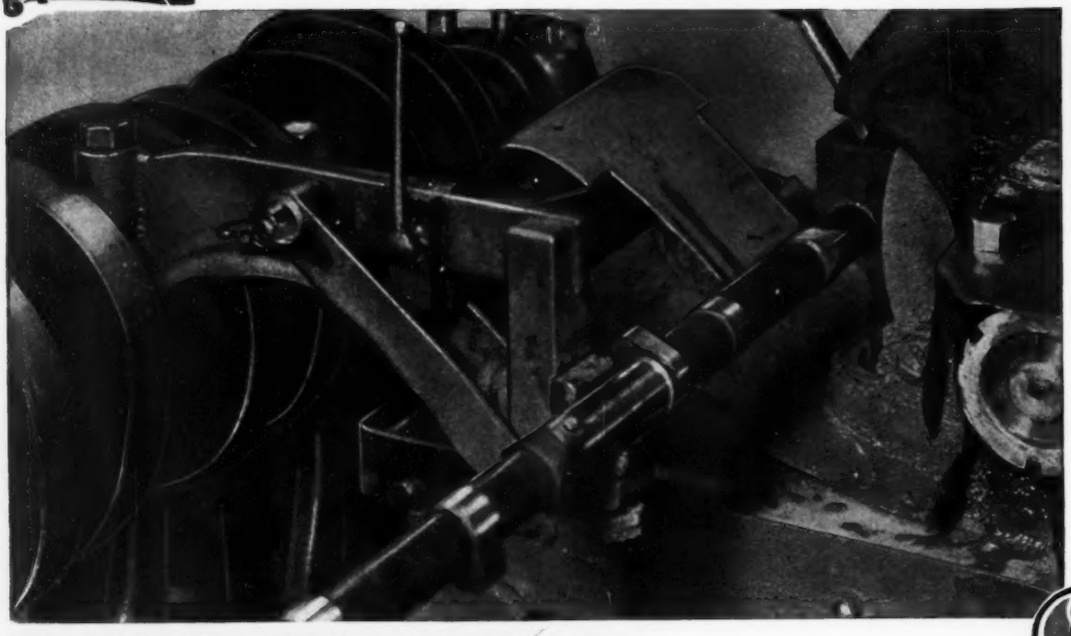


Section of the drag-rod showing how the same is built up without braced joints using large size spherical movements.

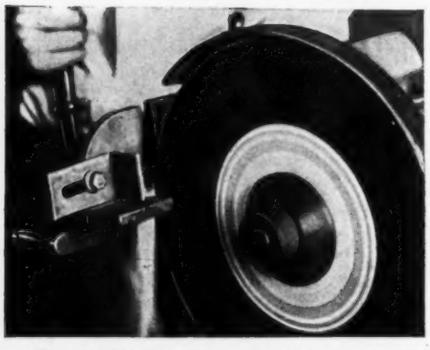


PLAN OF INDIVIDUAL CYLINDER FOR THE 35-HORSEPOWER MOTOR WITH A CROSS-SECTION SHOWING UNIFORMITY OF WALLS AND ALL DIMENSIONS, INCLUDING CLOSE LIMITS OF TOLERANCE

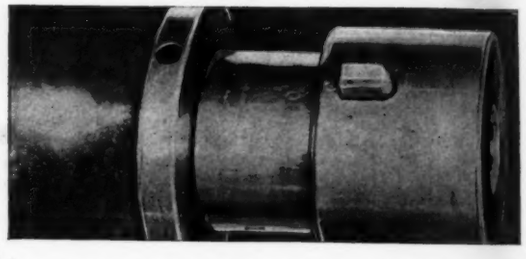
Plate III—Grinding Methods Obtain at Every Point That



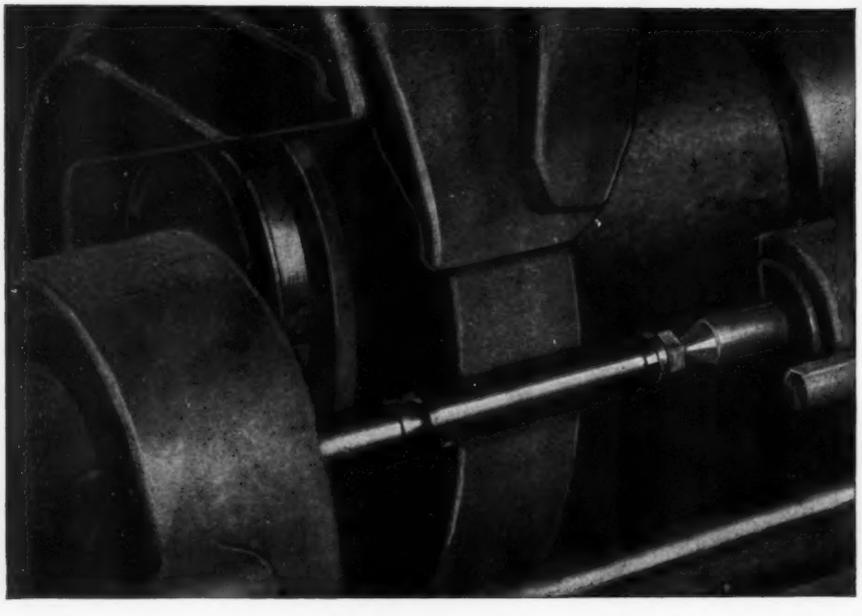
A—Special Type of Grinder Designed in the Overland Plant Shown in the Act of Grinding a Cam on an Integral Type of Camshaft, Reducing the Hardened Cam Faces to the Exact Design Contour Expeditiously



B—Special Form of Cutting-Off Tool Utilizing a Flexible Emery Wheel Cutting-Off Tool Steel Key Stock, the Latter Being So Hard That It Cannot Be Cut Off in Any Other Way—This Stock Is Used in Overland Cars for Keys Instead of Ordinary Cold Rolled Key Stock

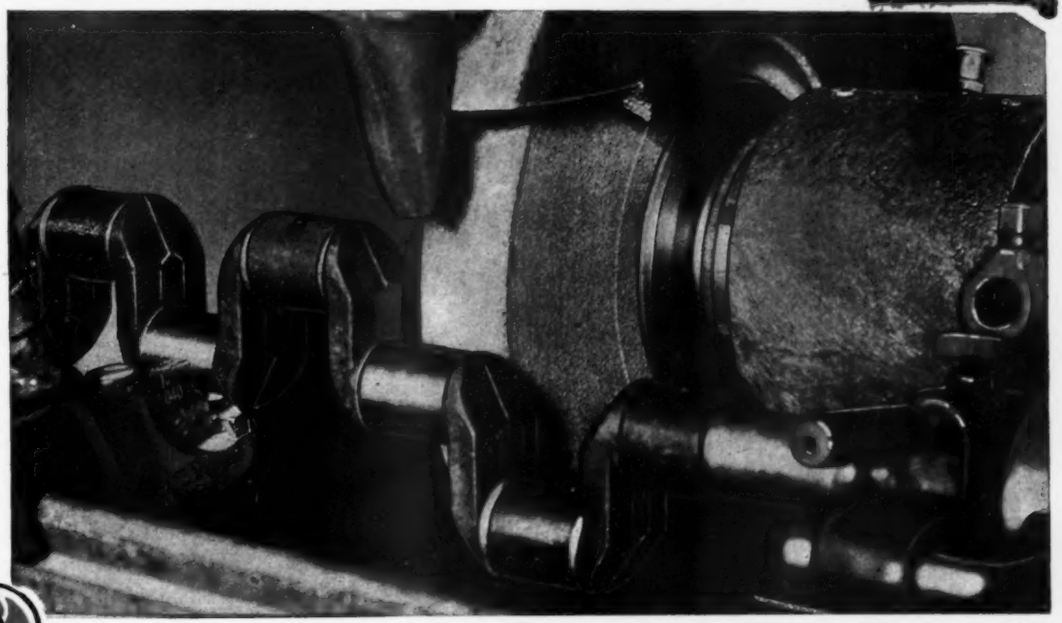


D—Heald Special Grindar, Designed for Internal Grinding, of Alloy Steel with Internal Bores to Be Reduced to a

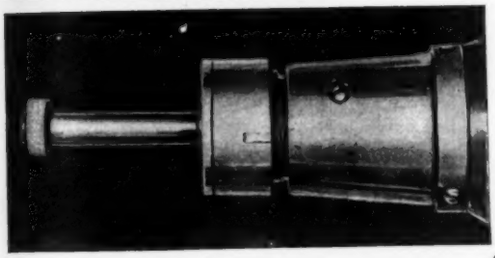


C—Large Wet Grinder on Hardened Piston Pins Working to a Limit of Tolerance of 0.0005

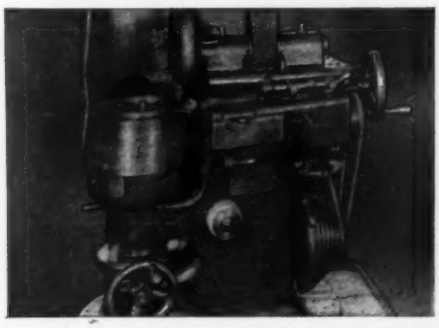
Demands Use of Hardened Materials and Accuracy of Finish



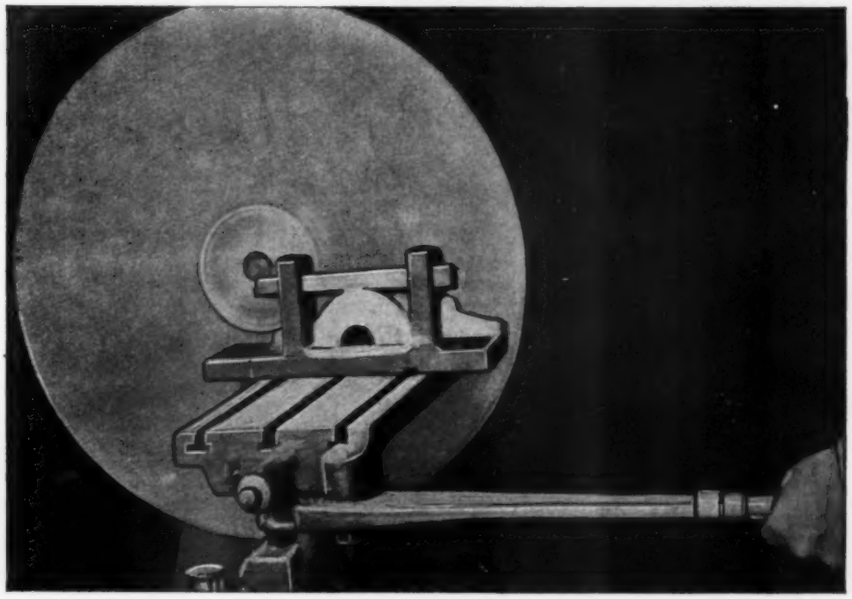
E—Norton Grinder Grinding the Main Bearing of a Crankshaft Working to a Limit of 0.0005 of an Inch as the Limit of Tolerance



Utilized for Ball-Bearing Cones and Other Parts Definite Size with a Limit of Tolerance of 0.0002

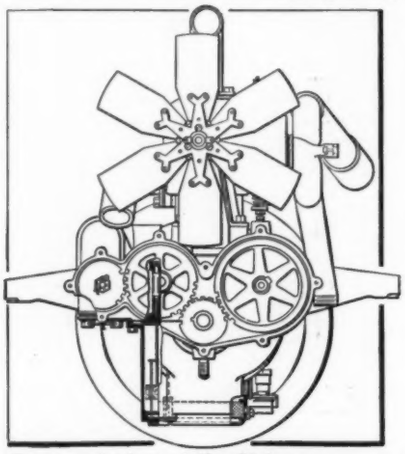


F—Magnetic Chuck Grinder Used for Finishing Piston Rings to Limits of Tolerance of 0.0002, Making Them Interchangeable and Free-Fitting But Gas-Tight



G—Example of the Utility of Large Diameter Disc Grinders Which Are Used for Facing Off Manifolds and Like Parts, Presenting Here the Work of Grinding Front Bearing Caps

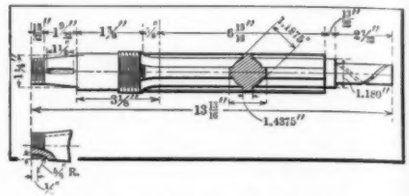
tomobile. On second thought this must be true, because with proper facilities it is possible to determine with great accuracy the cost of building automobiles so that the investment becomes scientific in its certainty of an honest return, and there is no gainsaying the fact that these assemblers of aggregations of picked-up material have the good taste and the sense of proportion that would compel them to prefer a certainty rather than to indulge in a speculation. What they need is the ability and the funds.



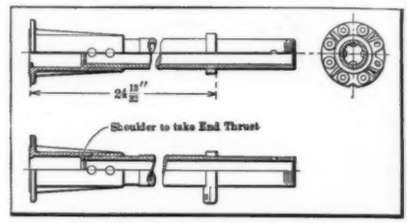
Front end view of the 35-horsepower motor with the cover for the halftime gear-box off, presenting evidences of substantial methods of construction

IF good automobiles can be built without first acquiring a sufficient measure of the facilities used under first-class conditions, why is it that some racing cars as they are used for advertising purposes, are so designed and constructed that they differ from the stock car specifications, and have to be entered in free-for-all events on that account? Why should the builders of this character of automobiles spend thousands of dollars in racing, and thousands more in making special cars for racing, if it be true that they can build good automobiles under bad conditions?

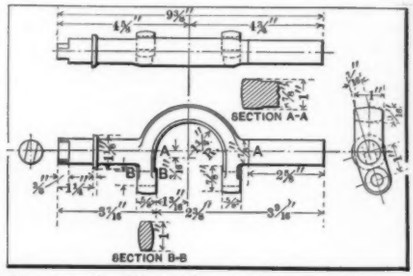
IS it not a reasonable assumption that the amount of money expended in thus hoodwinking the public, is far less than the $158,000 per model, for every model turned out, that would have to be paid for the special tools alone in order to manufacture a standardized automobile? Is there any chance of being mistaken when it is said that the public is hoodwinked every time a specially built racing car is scheduled in an event, if in the advertising of the result it is alleged that it is a stock car proposition? Is there any reason for concealing the fact that the A. A. A. rules are sufficiently liberal to permit of making alterations to cars if they are entered?



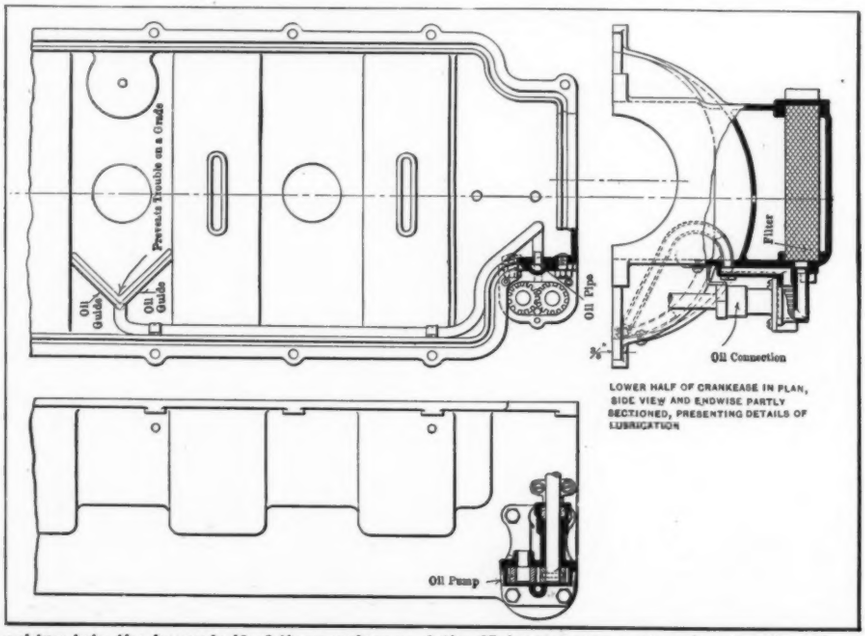
Presenting sliding gear spindle



Section of propeller shaft tube



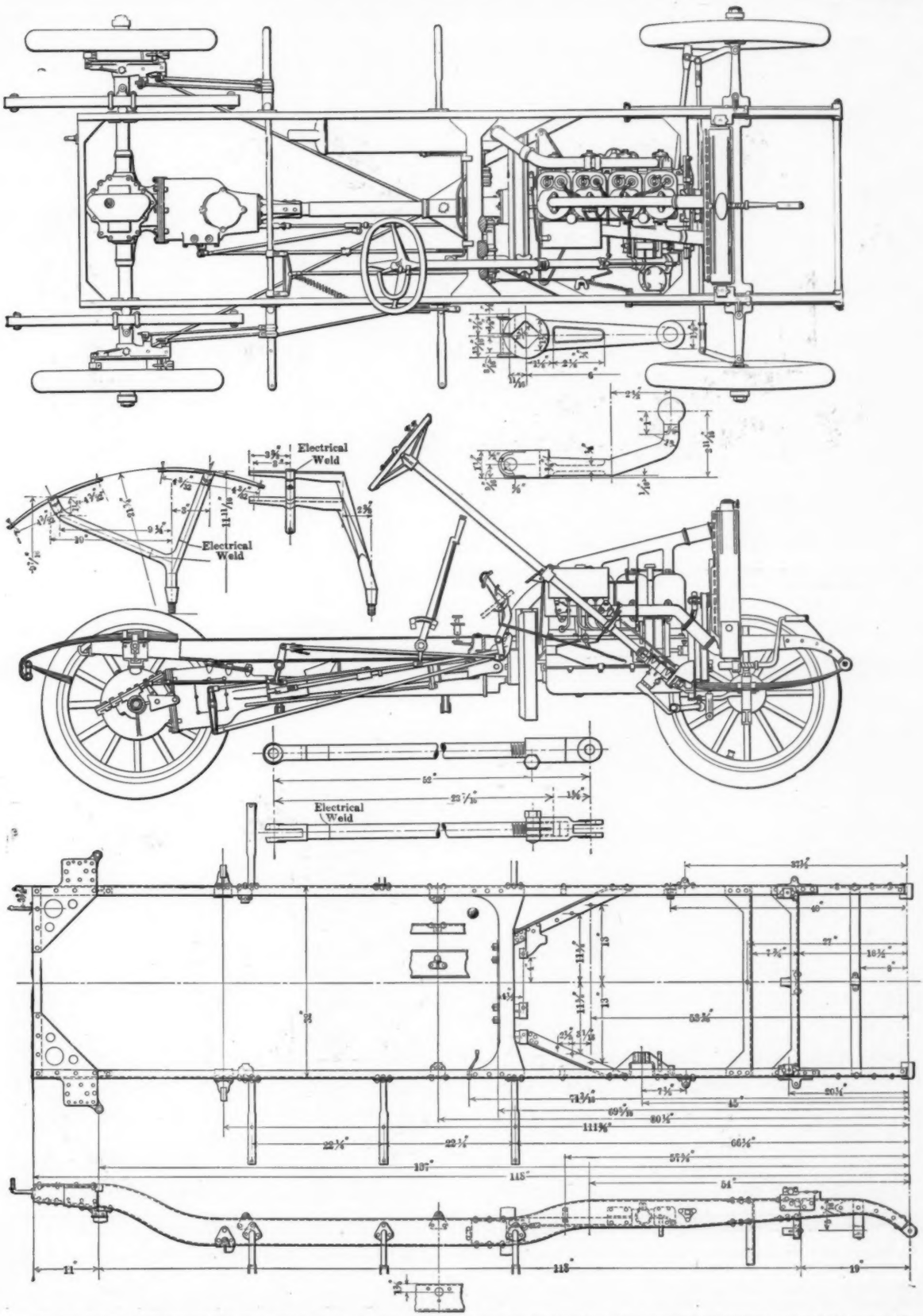
Clutch actuating yoke of drop-forged steel



LOWER HALF OF CRANKEASE IN PLAN, SIDE VIEW AND ENDWISE PARTLY SECTIONED, PRESENTING DETAILS OF LUBRICATION

Looking into the lower half of the crankcase of the 35-horsepower motor showing the oil container in the bottom and oil-ways cast integral

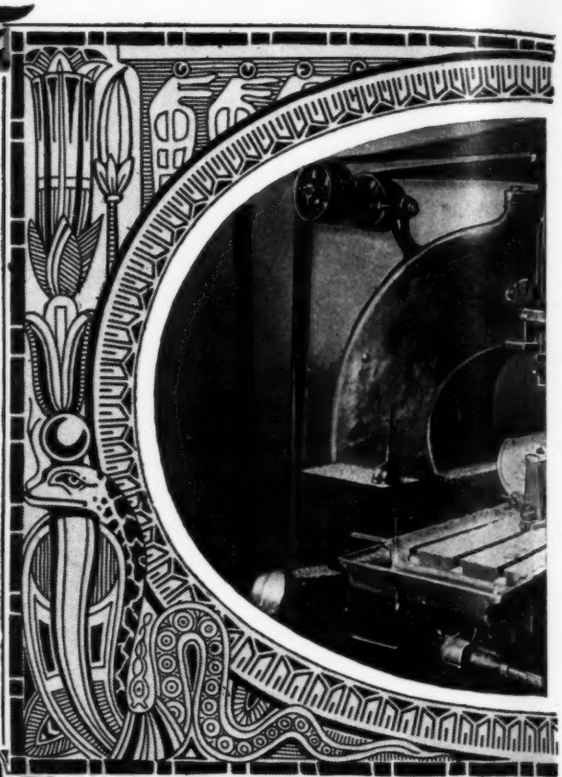
THERE is ofttimes expressed the belief that good automobiles will ultimately be sold at a very low price. A few years ago, when the hand-whittled products of Europe were cast adrift on the shores of America, and men of means with sporting proclivities purchased them at prices that ranged all the way from ten thousand to twenty thousand dollars apiece, they were looked upon as the toys of the rich, but American engineers and toolmakers recognized the weakness of the foreign situation.



PLAN AND ELEVATION OF CHASSIS, ALSO PLAN AND ELEVATION OF DOUBLE-DROP CHASSIS FRAME

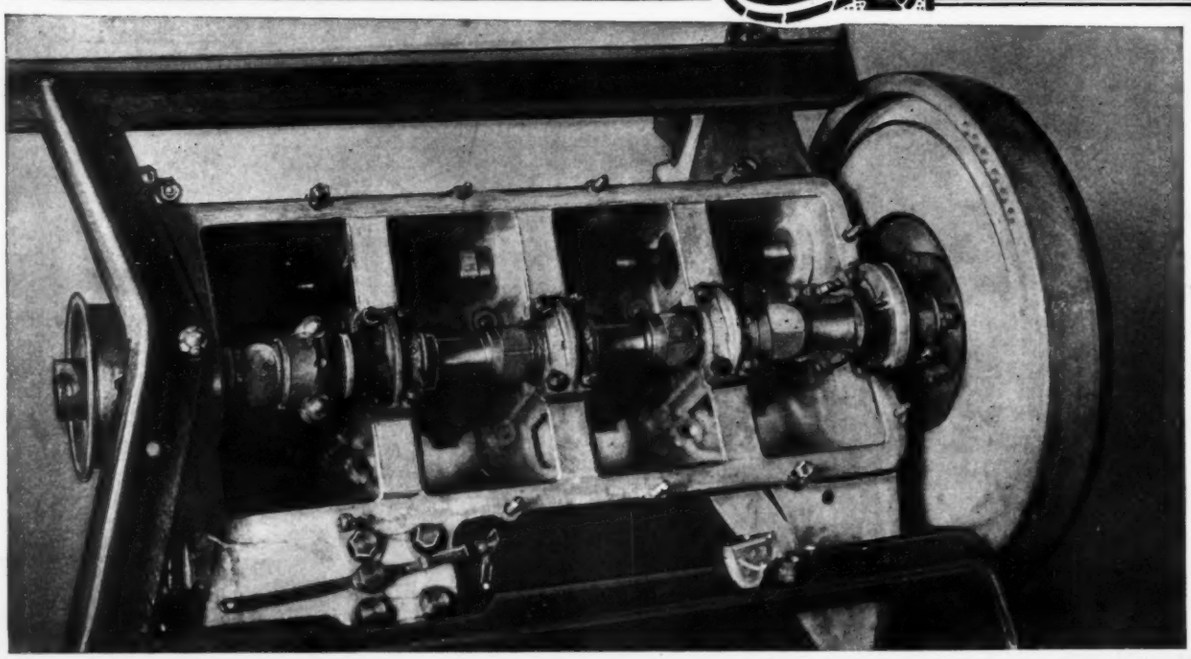
Plate IV—Sweet-Running Qualities Are Present in Proportion

A—Specially Contrived Form of Horizontal Boring Mill Arranged to Bore for the Crankshaft and Camshaft Bearings Simultaneously and Reducing the Time of Setting Up, as Well as Inducing Great Accuracy

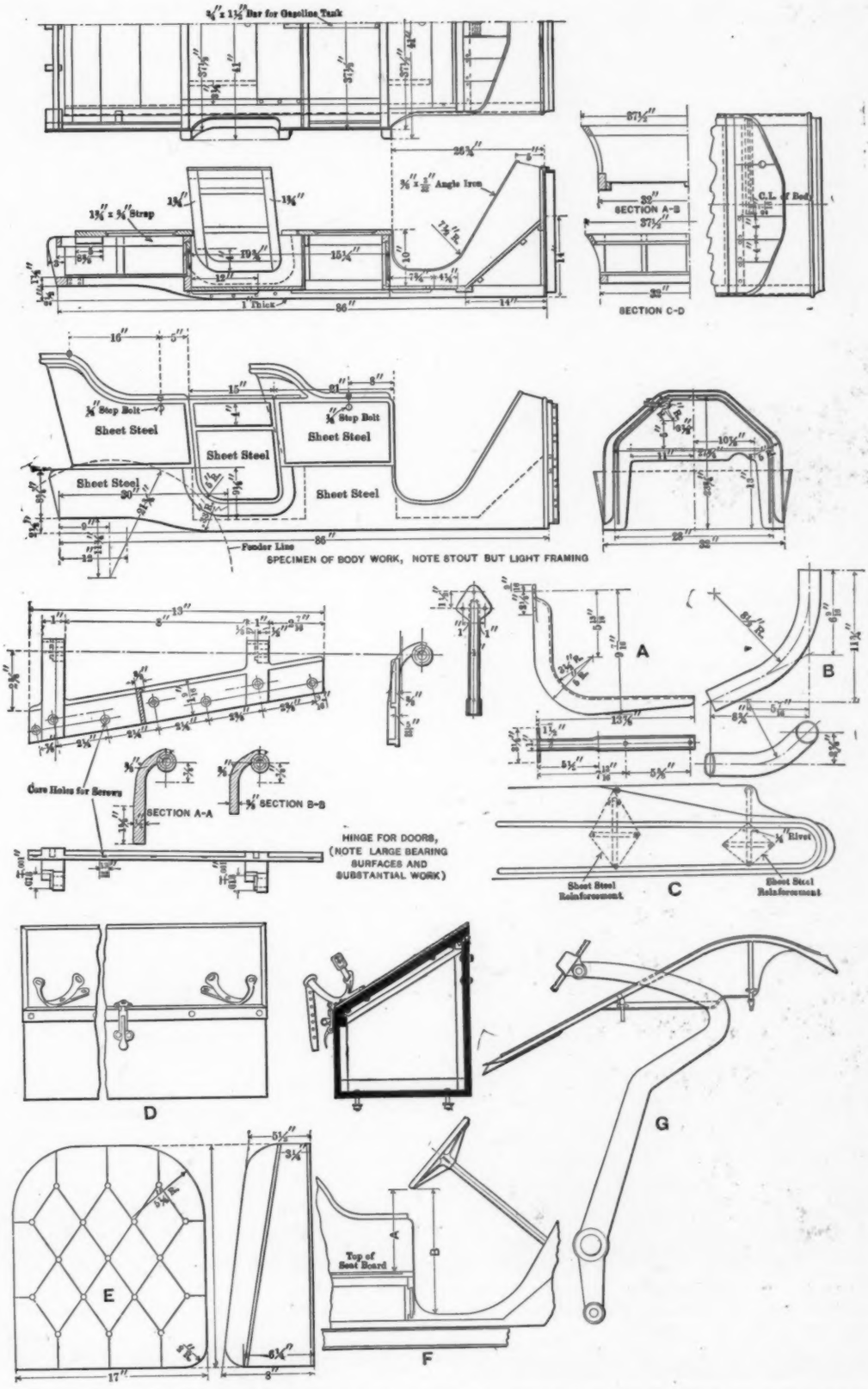


C—Substantial Form of Vertical Mill Fitted Facing off a Crankcase which is Strapped Revolving Cutter.

Overland



B—Motor with the Lower Half Removed Bolted to a Tilting Assembling Stand which is so Arranged that Motor May be Revolved, Placing it in the Several Advantageous Positions to Enable Workmen to do Quick, Accurate Assembling

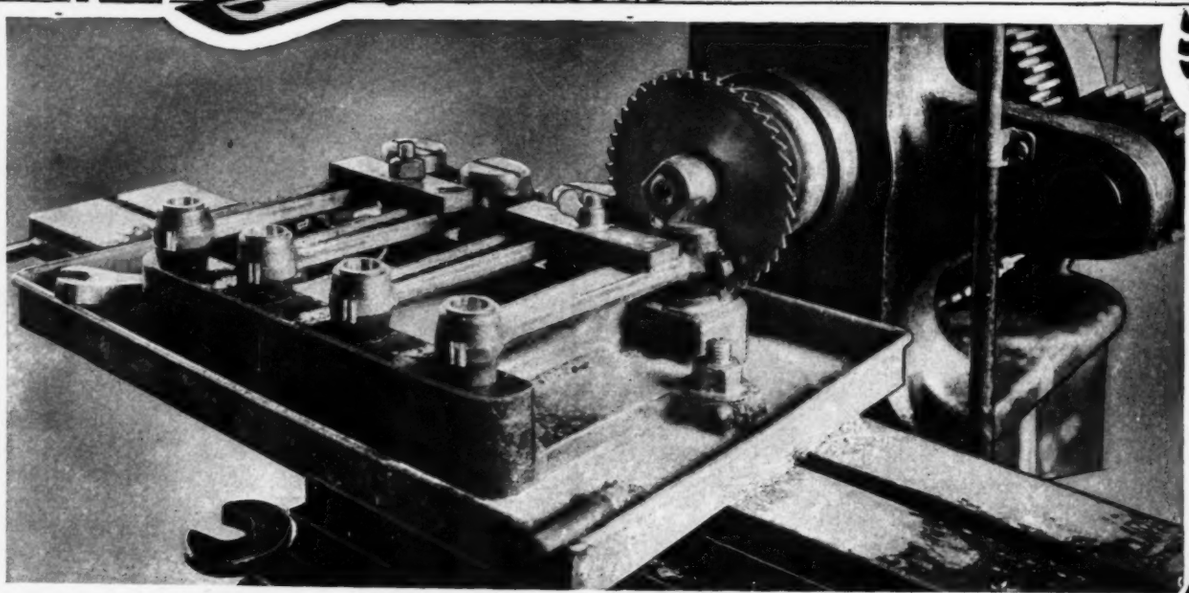


EXAMPLE OF OVERLAND BODIES AND OTHER DETAILS WORKED DOWN TO A NICETY

Plate V—Increasing Accuracy and Decreasing Cost are Brought

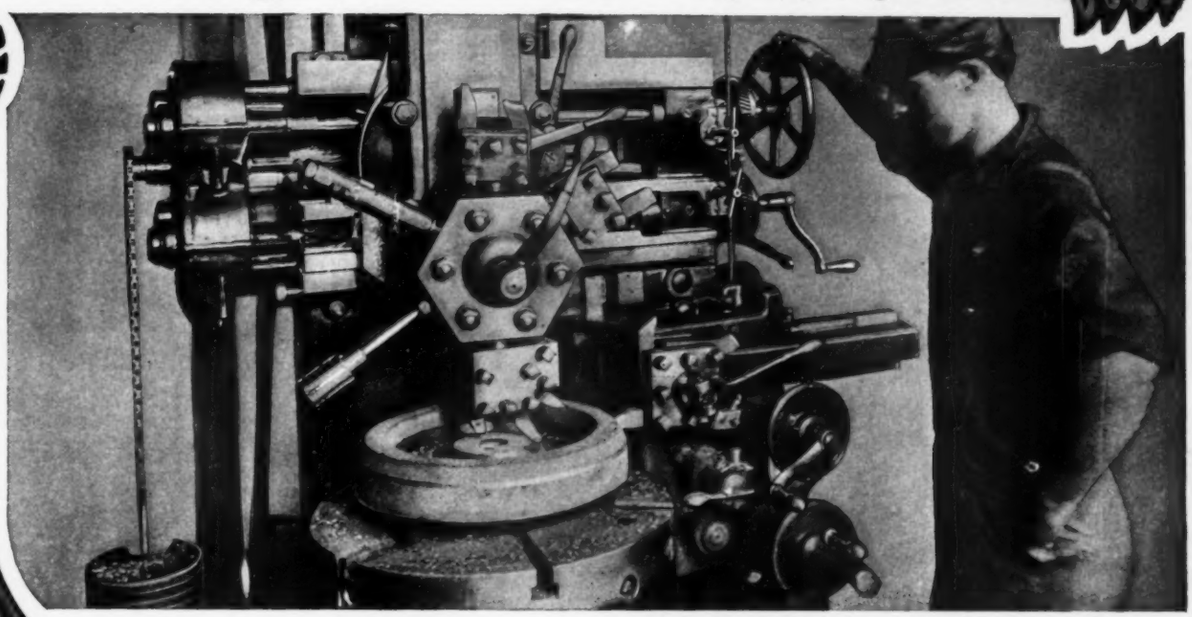
A—One Unit in a Well-Equipped Electric Welding Department Welding Mudguard Irons by which Process the Mudguards are Interchangeably Placed on Every Automobile Made and the Relating Parts are Brought to Machining Accuracy

B—A Six-Spindle Nut Tapping Machine Semi-automatic in Character Used for Accurately Tapping Nuts, with which One Boy Performs as Much Work as was Formerly Done by Six Men

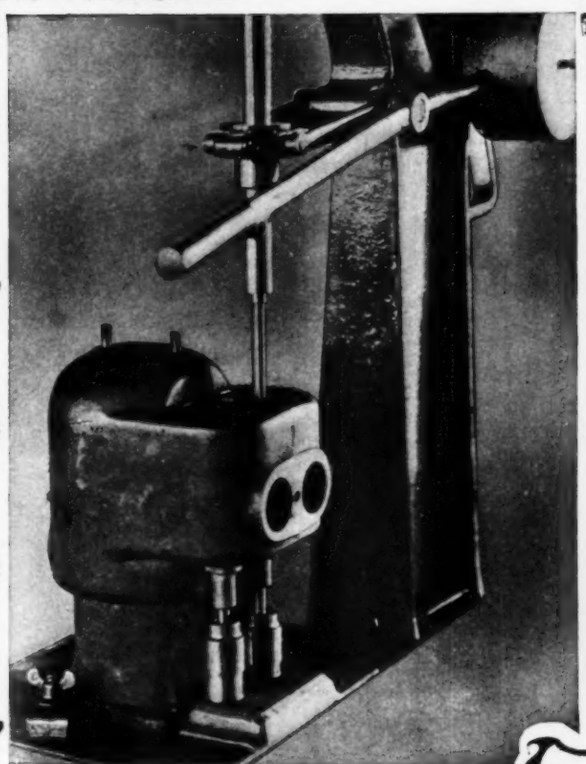


C—Slitting Connecting Rods in Gangs, Employing a Special Form of Fixture Bolted to the Platen of a Milling Machine Using a Saw in the Process

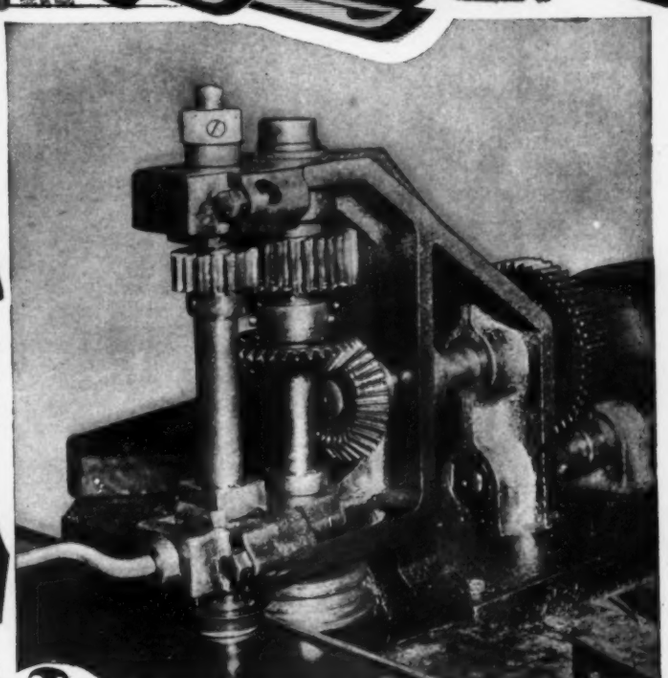
About by Reducing the Number of Setting Up Operations



D—Bullard Vertical Mill Fitted with a Turret Employing Multiple Cutters Doing all the Operations on a Flywheel Simultaneously; Utilizing Special Means of Accurately Centering the Work



E—Valve-Grinding Machine which is Designed to Produce Reciprocating Motion, Lift, and Other Movements Made by an Expert Grinder, with the Result that Work is Done Many Times Faster and with Far Greater Uniformity Because the Machine Does not Get Tired or Careless



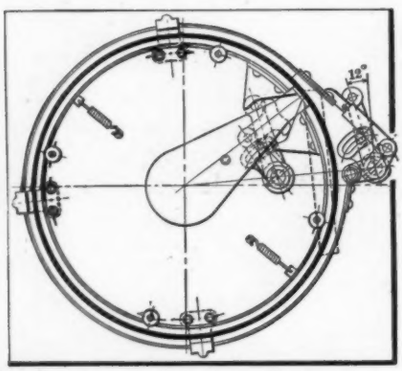
F—Fender Wiring Machine in Action, Showing How the Wire Binder is Turned Under Around the Edges of the Fenders, the Work Being Done Just as Expeditiously at Points of Curvature as Along Straight Lines, Resulting in Uniformity and Presenting Earmarks of Highest Type of Workmanship

Overland

any substance to speak of behind the reckless claims that are made in advertising generally? Would the men who pay for space in which to make their unsubstantiated claims pursue such a course if the purchaser were to write the word "Contract" across the top of the page and ask the maker to put his signature at the bottom of it?

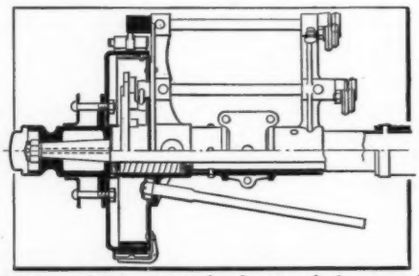
WHEN a man goes out to buy an automobile and he notices all the claims that are being made for this or that make of car in the advertising thereof, why is it that he permits a salesman to slur over the definite claims therein made and substitute a lot of colloquial piffle that releases the maker from further responsibility and puts the burden of proof up to the purchaser?

IS it not strange that even good business men forget, as the saying goes, "Ignorance of the law excuses no man?" In business law *caveat emptor* represents a principle that is as fixed as the rock of Gibraltar. It is another way of saying: "Let the purchaser beware." There is no chance of the buyer of an automobile getting the little end of the horn if he will sally forth with a string tied to one of the fingers of his right hand to remind him of *caveat emptor*, and another string tied around a finger of his left hand to remind him of his status as a buyer, i.e., "Ignorance of the law excuses no man."



Section through brakedrum showing method of adjusting take-up

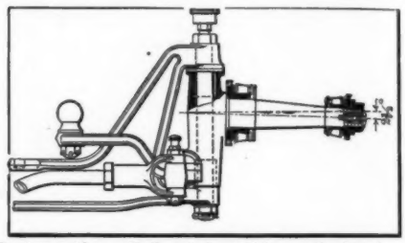
THERE still remains a considerable problem to be solved by the man who prefers to receive a dollar's worth of automobile for each dollar that he expends. This problem is shared by the maker who elects to deliver a dollar's worth of automobile for each dollar received. It is self-evident that an automobile that will deliver perfect satisfaction to one man may be entirely unsatisfactory to another—both cars may be thoroughly good in every way for the work for which they are intended.



Section of live rear axle showing hub pressed on taper end

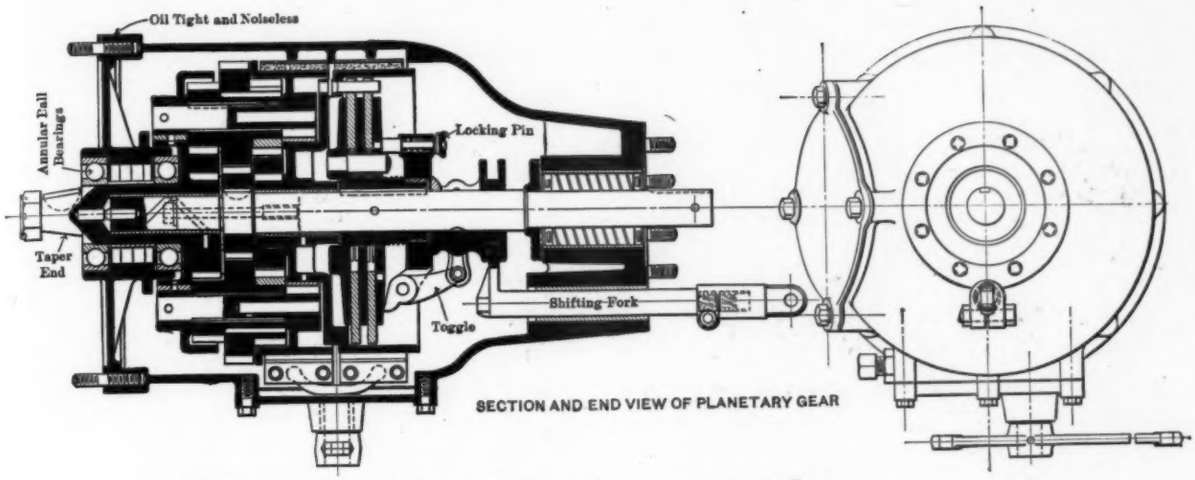
THE wise purchaser first examines himself with a view to determining his needs; he then proceeds to examine the automobiles of the makes that promise most. It is a matching process, just as a sample of cloth is used and matched up if more cloth of the same kind is wanted. When the purchaser finds the automobile that matches with his needs, he may then proceed to buy it. He will be wise, if, after having made up his mind, he keeps it made up. Substitutions "a la drugstore" are distinctly bad.

FROM the maker's point of view, since there is a diversity of purchasers to satisfy, he is compelled to invest in a promising variety of models in order that he can honestly entertain the various types of intending purchasers. Experience teaches that purchasers may be divided into from ten to fifteen distinct classes, each of which requires models of cars that are sufficiently at variance with each other to demand that they be given separate consideration; and if one model of car requires the expenditure of $158,000 for special tools in the building of it, even though this figure is not multiplied by the number of models turned out, does it not indicate that the maker who is lacking in means finds himself incapable of manufacturing a sufficient number of models to satisfy the existing demand?



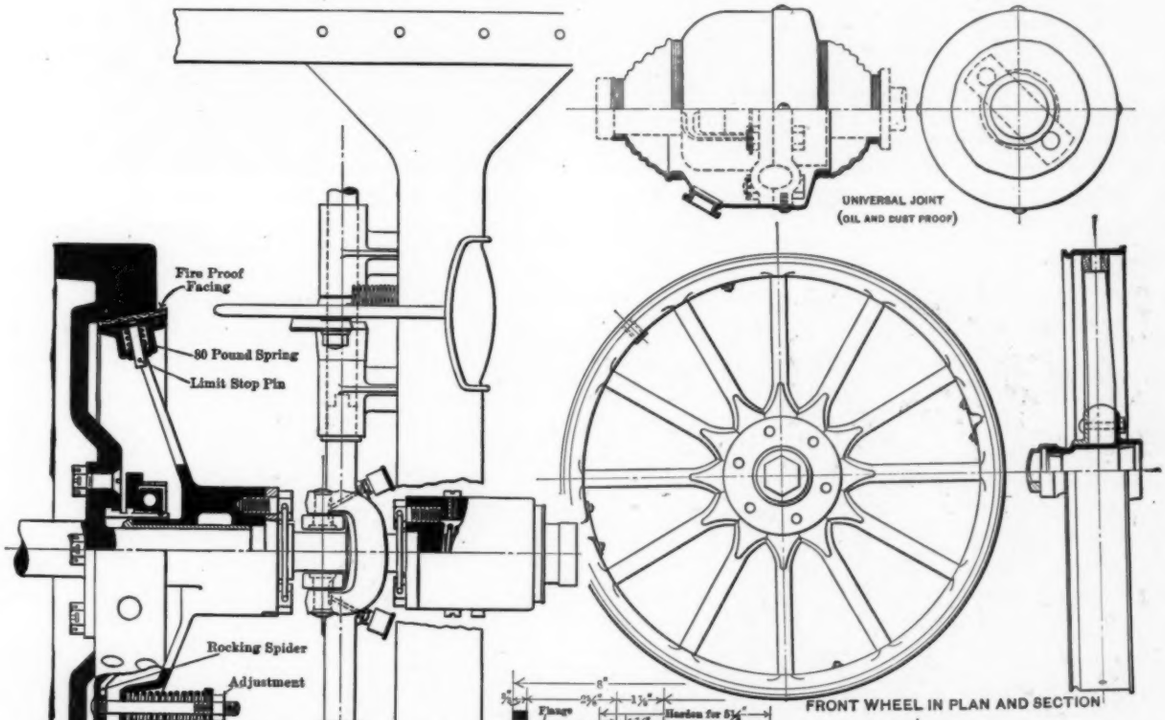
Part section of front knuckle and shank of I-section front axle

WHAT is the alternative? Obviously, the maker with limited facilities must either cater to a restricted clientele or fudge up the required number of models, doing the best he can with his restricted facilities. Will this effort on his part, however ambitious, be up to the standard set by engineers as necessary to the well-being of the automobile business? How can it be? No other established business, ever succeeded in spreading out thin and at the same time maintained a reputation for that peculiar quality which brings a glow of satisfaction to the cheek of the fastidious.



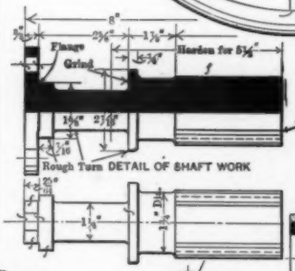
SECTION AND END VIEW OF PLANETARY GEAR

UNIVERSAL JOINT
(OIL AND DUST PROOF)

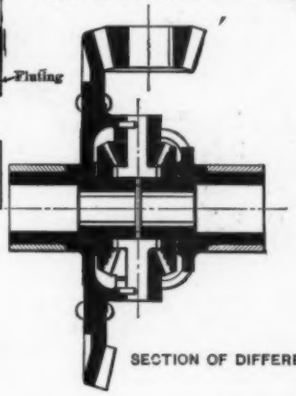


FRONT WHEEL IN PLAN AND SECTION

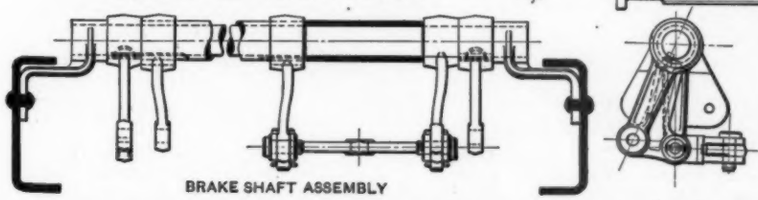
SECTION OF CONE CLUTCH AND CONTROL



DETAIL OF SHAFT WORK



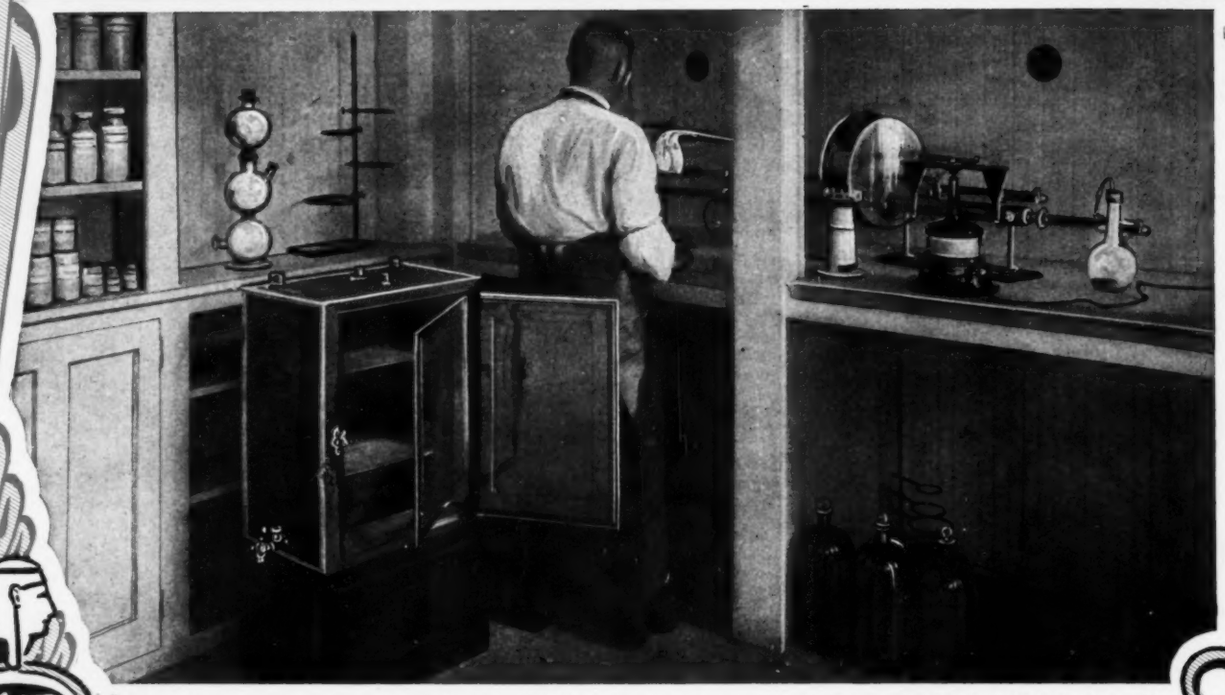
SECTION OF DIFFERENTIAL



BRAKE SHAFT ASSEMBLY

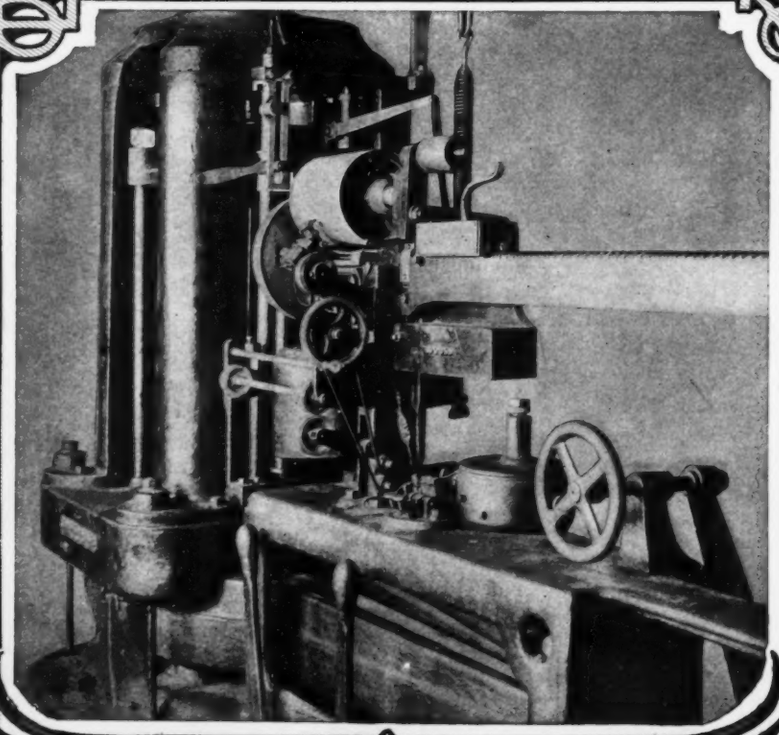
SECTIONS OF PLANETARY GEAR, CONE CLUTCHING MECHANISM, FRONT WHEEL, DIFFERENTIAL AND OTHER PARTS INDICATING EXACTNESS IN THE DESIGNING PROCESS

Plate VI—Basis of All Engineering Effort is the Laboratory,

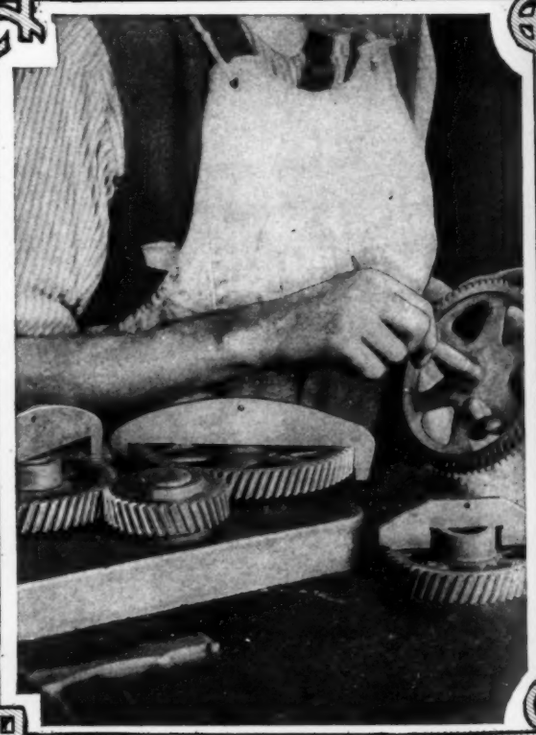


Overland

A—Chemical Laboratory Fitted Out with the Latest and Most Approved Equipment and Methods for Determining the Chemical Composition of every Character of Material Employed in Overland Automobiles

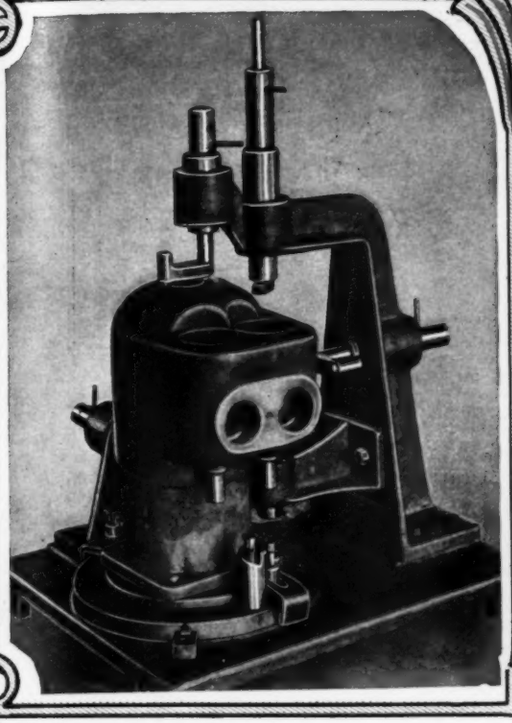


B—Olsen Testing Machine of One Hundred Thousand Pounds Capacity for Use in Determining the Physical Properties of Steel and Other Materials

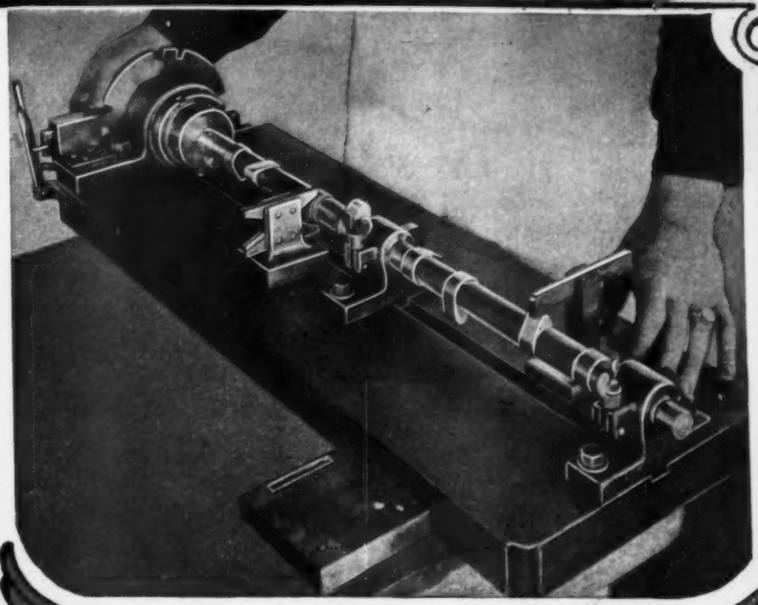


C—Special Form of Equipment Designed to Test Gears for Centers, Bores, and Critical Dimensions

with Chemical Analysis, Physical Tests, by Skilled Physicists

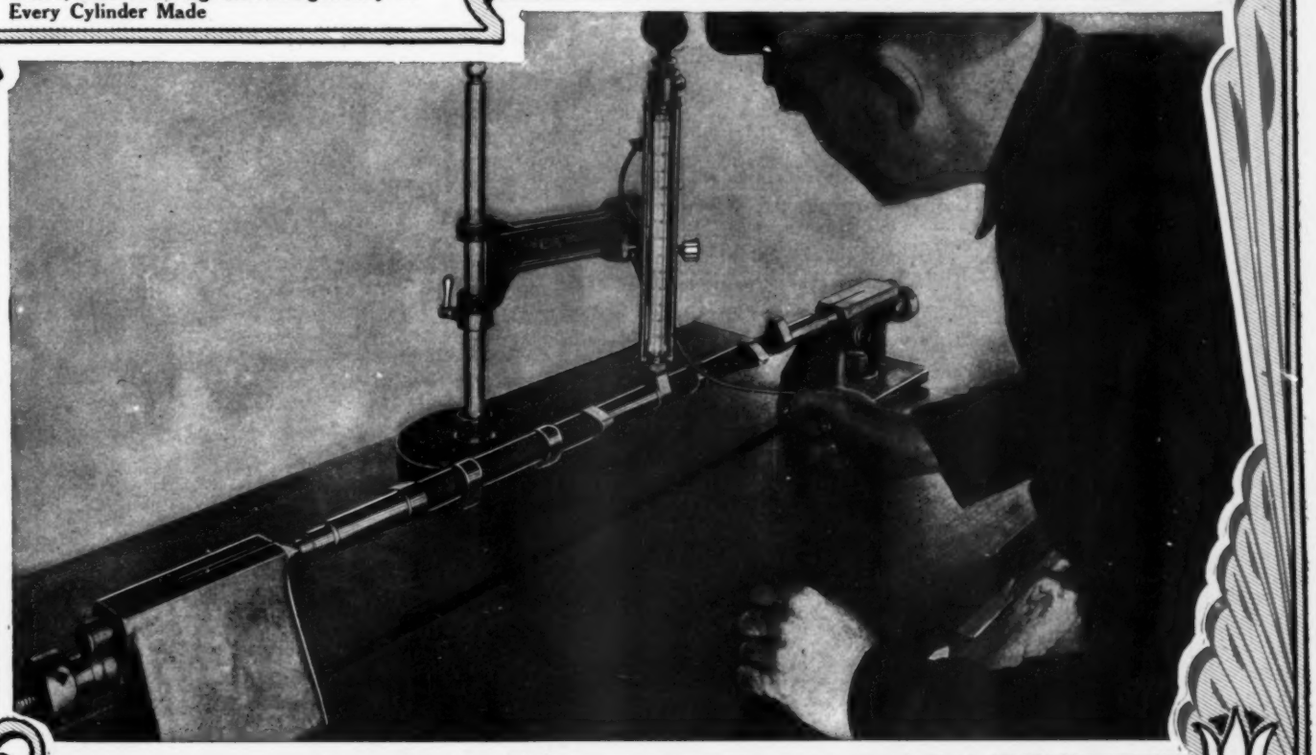


D—Special Form of Go-gauge Made in the Overland Plant by Means of which the Precision of Finish of Cylinders is Accurately Determined, thus Assuring Interchangeability of Every Cylinder Made



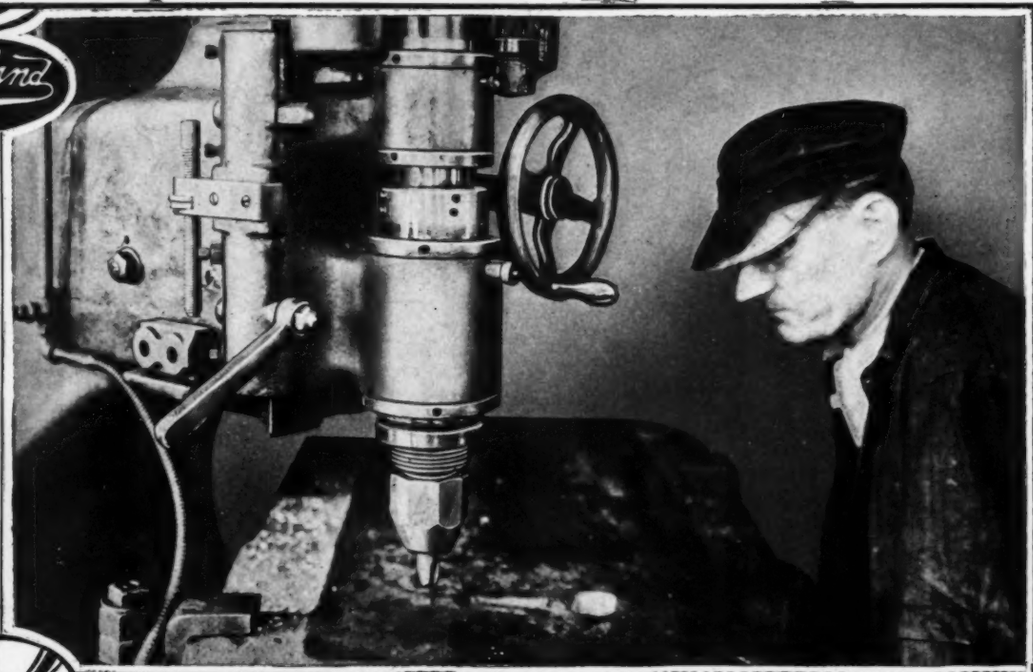
E—Special Form of Testing Equipment Built in the Overland Plant by Means of which the Angularity, Shape, and Lift of Cams on Camshafts are Accurately Determined, Through Which Process Every Camshaft is Put

Overland



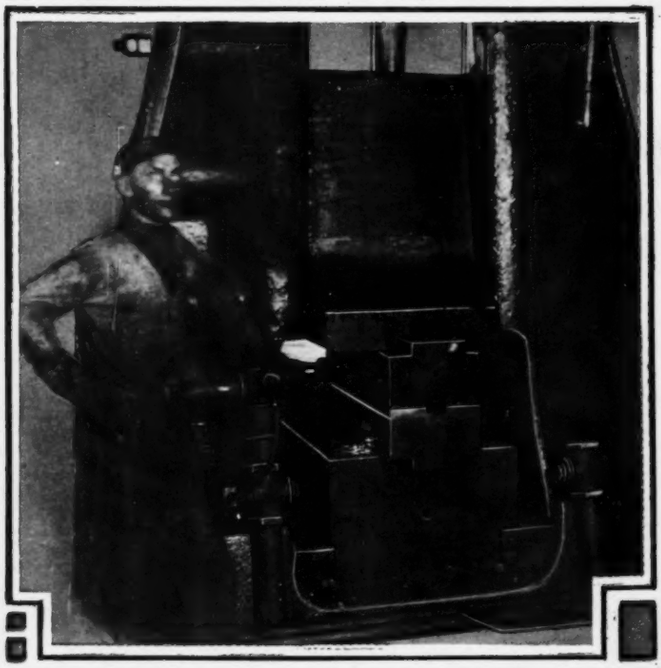
F—Scleroscope Used in Determining the Hardness of the Finished Cams on Overland Camshafts as Here Illustrated; Also Used for Testing the Teeth of Gears for Uniformity of Hardness and Other Like Work

Plate VII—To Produce Quality Cars in Quantity, Drop-forging



A—Depicting a Vertical Routing Machine Routing Out for a Breaking-down Die to Be Used in Drop-forging, Special Steel I-Section Front Axles

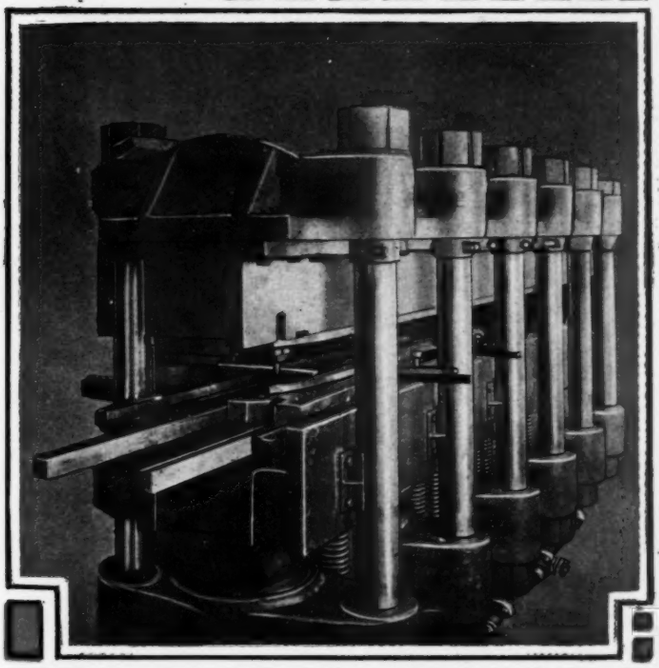
B—Heavy Press in the Act of Drop-forging a Special Steel I-Section Front Axle, Showing How the Bar of Steel Is Placed on the Breaking-down Die and Given Its Preliminary Shape



C—Shows the Large Drop-forging Press as Utilized in Front Axle Work, with the Tup Down, Giving an Idea of the Enormous Hammer Blows Required in This Character of Work

Machinery is Necessary to Guard Against a Famine of Parts

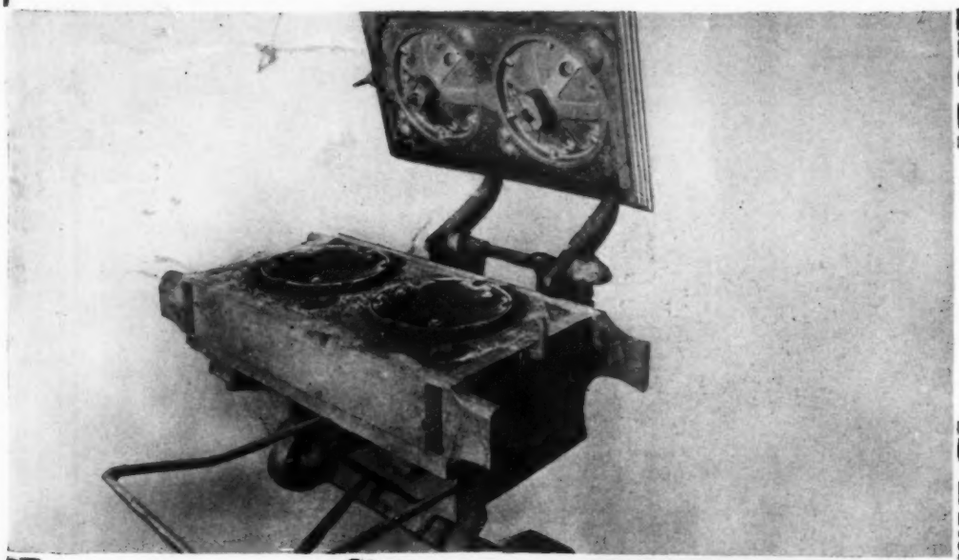
D—A 2,500-Pound Toledo Hammer Working on Drop-forged Crankshafts of 40 Carbon Steel, This Being One of a Considerable Battery of Hammers in the New Overland Drop-forge Plant



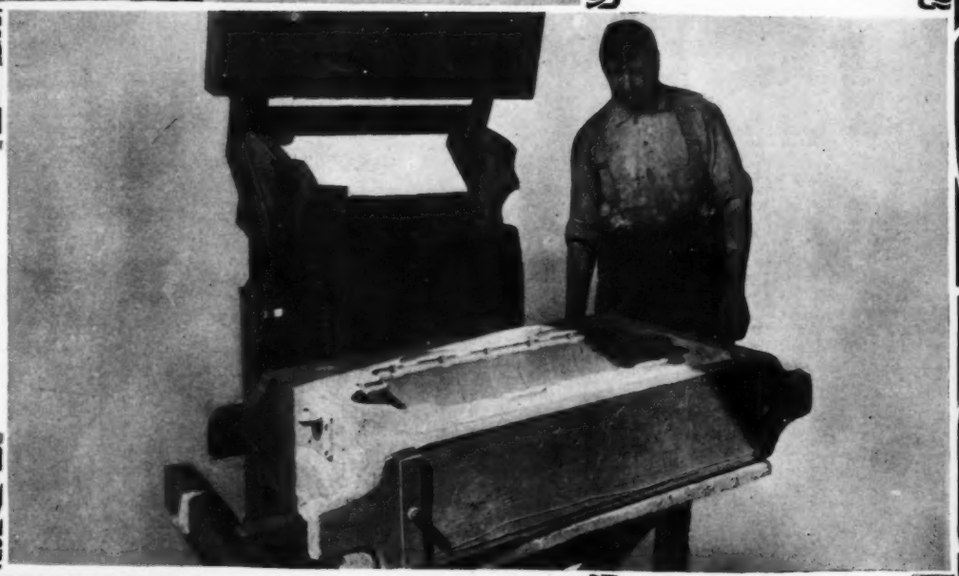
E—Hydraulic Press Rated at 175 Tons, Designed for Use in the Overland Plant, Making Double Drop I-Section Sidebars, Fitted Out to do a Variety of Chassis Frame Work, This Being One of a Battery of Presses

F—Special Jigging Fixture Designed for Use in Assembling Chassis Frames, so Contrived That All the Holes Are Drilled Interchangeably and the Work Is Held Securely in Position During the Process of Riveting

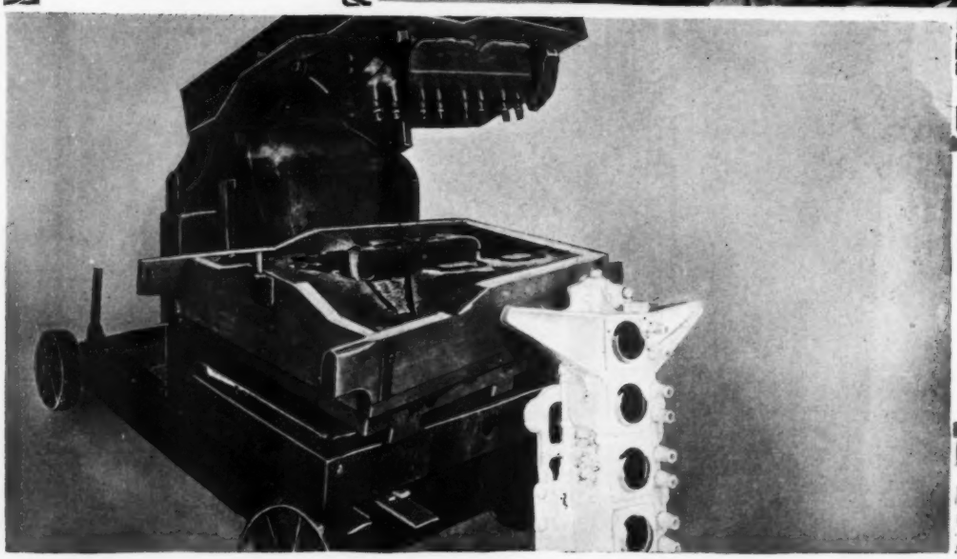
Plate VIII—Extensive Use of Aluminum Castings and Necessity



A—Moulding the Aluminum Clutch, Showing the Cope and Drag, the Latter Being Raised Up, Affording an Opportunity to Observe as to the Care with which this Work Must be Done



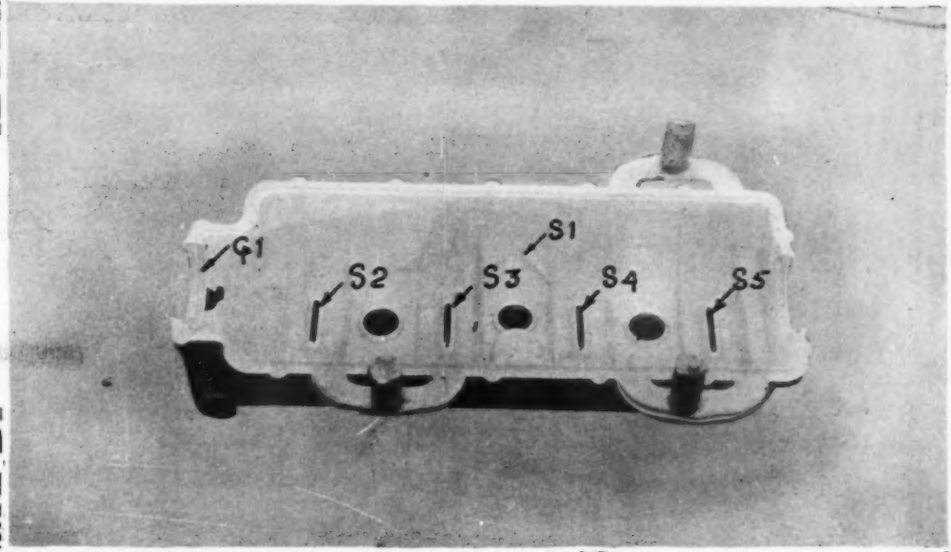
B—In the Process of Moulding Crankcases, Presenting the Mould After the Pattern is Removed, Leaving the Sand in Replica Thereof

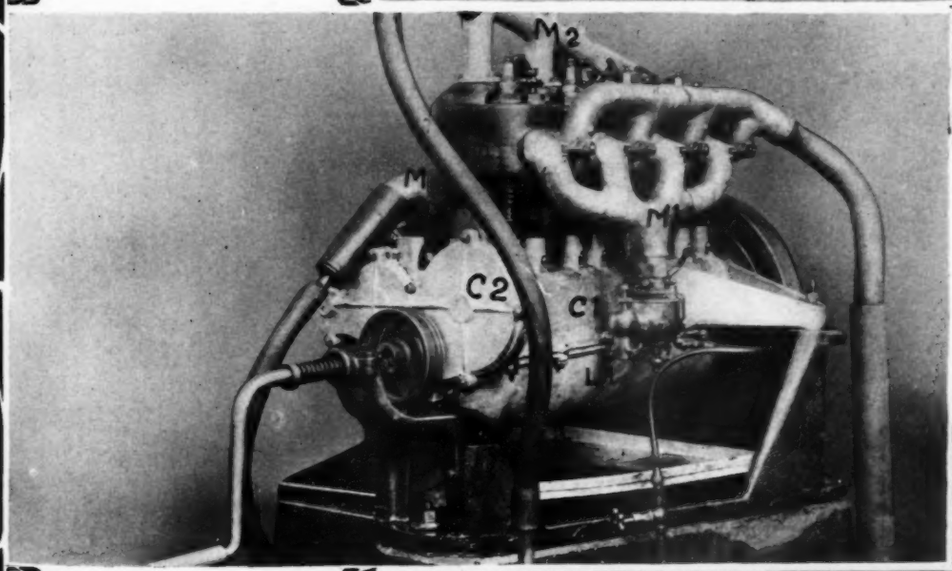


C—Moulding the Aluminum Crankcase, Showing the Casting Standing Up Against the Drag of the Mould, the Cope Having Been Removed, Presenting a Fine Character of Work

# of Fine Cylinder Castings Require Modern Foundry Equipment

D—Lower Half of a Crankcase as it is Broken Out of the Sand, Indicating the Oil-Spreader S1, which is Cast Integral, Calling Attention to the Groove G1 which Passes all Around the Flange to Make the Case Oil Tight, and the Spillways S2, S3, S4 and S5, Through which the Oil Flows, Maintaining a Constant Level —Attention is Called to the Function of the Oil-Spreader S1 which Prevents the Oil from Piling Up when the Car is Travelling Up or Down a Steep Hill. The Lower Half is Resting on New Pig—No Scrap is Used in Overland Aluminum Castings



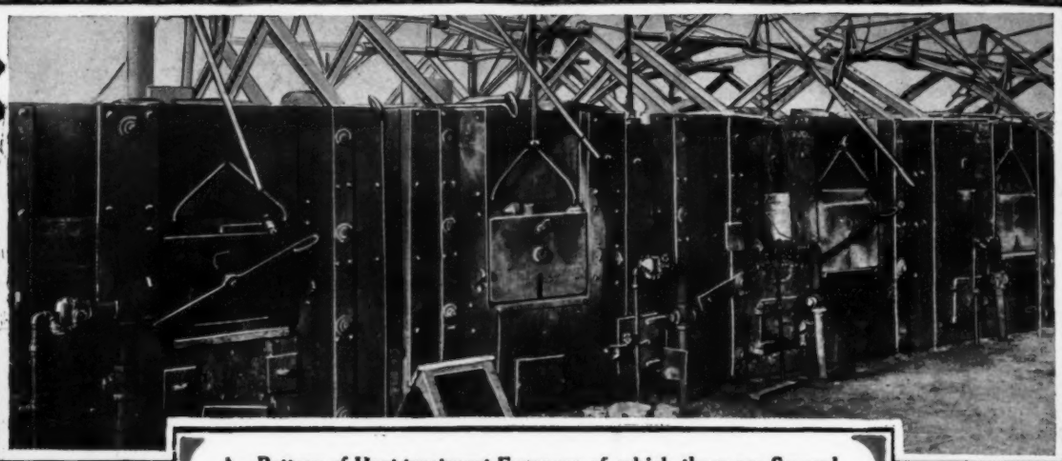


E—Motor on Test Block in Position to be Investigated for Perfection of Assembling, Smooth Running Qualities, and Noiseless Performance—Attention is Called to the Considerable Use of Aluminum in this Work. The Castings L1, C1, M1, M2, C2, and M. being of this Metal

Overland

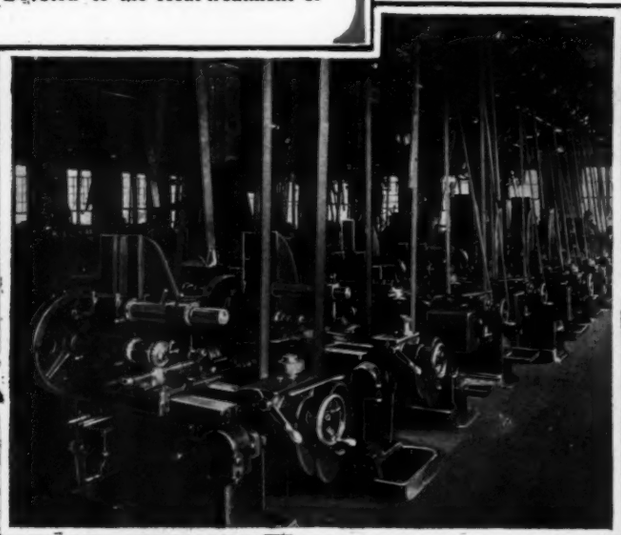
F—View of the Well Equipped Laboratory, the Function of which is to Establish the Chemical Composition of Materials to be Used in Castings as Made in the Foundry, and to analyze the Castings when they are Made in Order to Determine the Uniformity of Charging—Steel and Other Materials are also Checked for Chemical Composition in the Same Laboratory.

Plate IX—Random Shots Taken with a Camera, Indicating in

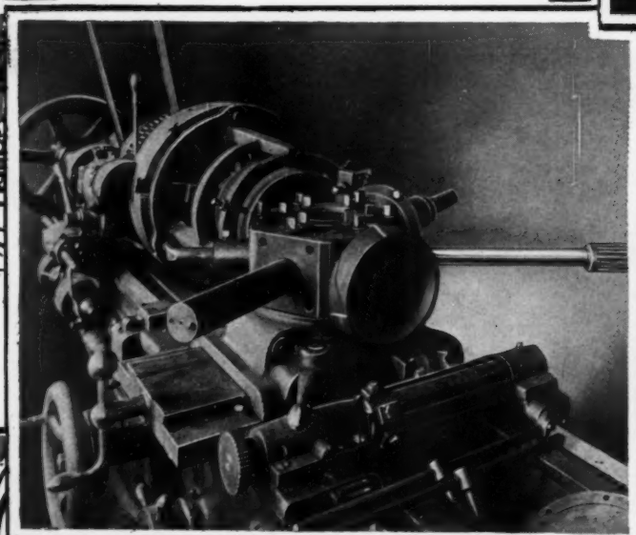


A—Battery of Heat-treatment Furnaces, of which there are Several, this Particular One Being Devoted to the Heat-treatment of Crankshafts and like Parts.

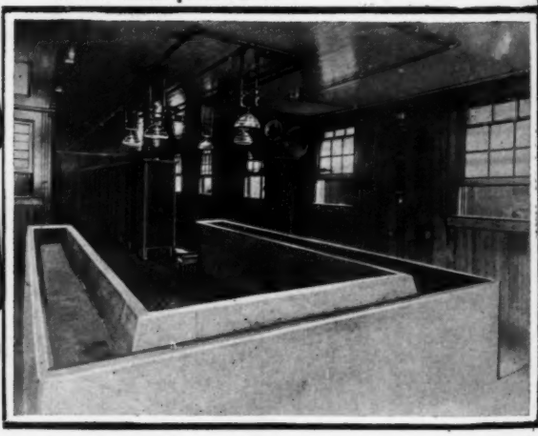
B—The Entire Plant is Operated by Electric Motors. This is a View of the Main Switchboard and the Battery of Transformers from which the Electric Current is Taken



C—Battery of Brown & Sharpe Gear-cutting Machines Indicating Something of the Requirements from the Point of View of Quality and Quantity of the Gears Turned Out



D—Heavy Turret Lathe with a Fixture Bolted to the Face Plate to Carry the Shell of the Planetary Gear and a Sufficient Variety of Tools Mounted to Perform the Successive Operations Expeditiously



E—Shower-bath and Washstands Adjacent to the Forge Placed at the Disposal of the Employees